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MAN AND APES,

AN EXPOSITION OF

STRUCTURAL RESEMBLANCES AND DIFFERENCES BEARING UPON QUESTIONS OF AFFINITY AND ORIGIN.

BY

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TO

W. K. PARKER, ESQ., F.R.S.,

THIS LITTLE WORK IS

Dedicated,

AS A SLIGHT MARK OF THE ADMIRATION

AND REGARD FELT FOR HIM

BY

HIS AFFECTIONATE FRIEND,

THE AUTHOR.

© 1 Je 23 KHW

422676

DESCRIPTION OF FRONTISPIECE.

FIG.

1. The Gorilla (*Troglodytes Gorilla*).
2. Skull of the Gorilla vertically and antero-posteriorly bisected, to show the great sagittal crest (*s*) rising above the brain cavity, and the supra-orbital crest (*o*) above the orbit.
3. The Squirrel Monkey (*Chrysothrix sciurea*).
4. The Potto (*Perodicticus Potto*), showing the rudimentary condition of the index finger.
5. The Angwántibo (*Arctocebus calabarensis*).
6. The Tarsier (*Tarsius spectrum*), showing the foot at its maximum of elongation, relatively, in the whole order Primates.
7. The Aye-Aye (*Cheiromys madagascariensis*).

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MAN AND APES.

PART I.

THE too frequent injustice of popular awards is a trite subject of remark. Christopher Columbus, with a hardihood now somewhat difficult to realise, sailed across an utterly unknown ocean to the discovery of a New World, which nevertheless has not received its appellation from him, but from his imitator, Amerigo Vespucci.

As with the new geographical region so with the new force "galvanism." It received its name from Galvani, who called attention to it in 1789; but Swammerdamm had none the less discovered it more than a hundred and thirty years earlier.

Again, the doctrine of evolution as applied to organic life—the doctrine, that is, which teaches that the various new species of animals and plants have manifested themselves through a purely natural process of hereditary succession—is widely spoken of by the term "Darwinism." Yet this doctrine is far older than Mr. Darwin, and is held by many who deem that which is *truly* "Darwinism" (namely, a belief in the origin of species by natural selection) to be a crude and utterly untenable hypothesis.

We find yet another and parallel example of popular misapprehension in the opinion widely prevalent respecting one species of those animals—the apes—which most nearly resemble us in bodily structure.

The species referred to is the much-talked-of Gorilla, and the popular misapprehension concerning it is twofold; first as to its discovery, and secondly as to its nature.

The Gorilla is very generally supposed to have been first discovered and made known

to science by M. de Chaillu, whereas, in truth, it was both discovered and described years before M. de Chaillu's name was heard of in connection with it.

It was discovered by Dr. Thomas Savage, who, with the assistance of an American missionary, the Rev. Mr. Wilson, procured enough anatomical materials to enable Professor Jeffries Wyman (in the United States) to describe * important parts of its anatomy.

Other specimens were soon afterwards procured, and were described in our own country by Professor Owen † more than twenty years ago.

The misconception as to the discovery of the Gorilla, however, is but a trifling matter; that as to its nature and rank is of far greater importance.

The lively interest which has been awakened by recent assertions respecting what is

* See 'Boston Journal of Natural History,' vol. iv. 1843-4, and vol. v. 1847.

† See 'Pro. Zoo. Soc.' 1851, and 'Trans. Zool. Soc.' vol. iv. and v.

called "the descent of man," manifests itself far and wide in the daily press—in popular caricatures—on the theatrical stage, and in the Houses of our own Legislature as in the French Assembly.

It is interesting also to note that whereas a few years ago the notion of the brute origin of man was vehemently and all but universally scouted, the public are now carried by a wave of sentiment in a diametrically opposite direction, and there is even a widely diffused sympathy with notions which but lately were found so unpalatable. *Then* there was not tolerance to listen to, far less to fairly appreciate, the arguments advanced by certain men of science in support of their views. *Now* there is as little disposition as ever to weigh evidence, but the tendency is to accept without examination and without criticism the statements of every advocate of the essential unity of man and beasts.

Concomitantly with this change of sentiment there has also arisen a popular belief in

the semi-humanity of the Gorilla, or at least an impression that the Gorilla possesses a very special and exceptional affinity to man. This animal is now popularly supposed to be closely connected with that "missing link" which, as is asserted, once bridged over the gulf separating man from the apes. The Gorilla, if not the direct ancestor of man, is yet generally thought to be related with exceptional closeness to such direct ancestor, and so to constitute the one existing and visible bond between ourselves and the lower animals. Highest of apes—close ally of the Negro—the Gorilla is by some supposed to surpass and excel the humbler and commoner apes, as man surpasses and excels the Gorilla.

It is proposed here, putting aside all prejudice, to investigate, by the unimpassioned process of enumerating and weighing facts of structure, what is the teaching of nature as to the affinities of various apes to man. It is not, therefore, intended to touch directly upon the question of the ape origin of man considered

in the totality of his nature, because that is a matter not to be settled without the intervention of the philosopher and the psychologist. The anatomist—as such, however wide and detailed may be his acquaintance with different animals—is necessarily incompetent to offer a valid opinion on the subject.

The matters to be here investigated concern physical science only—facts of zoology and of anatomy, together with the inferences which may be drawn from them respecting man's bodily structure. The questions, then, which are to occupy us, are the following: 1. What is the real zoological position and nature of the Gorilla? 2. What are the degrees of resemblance to man which the various kinds of apes exhibit? 3. What is the bearing of these facts upon the doctrine of evolution (or derivation), as applied to man's body, including the question as to the direction which the line of genetic affinity seems to take in passing from man through the apes to lower animals?

Whatever existing species is most nearly

related to that extinct root-form, which, according to Mr. Darwin's hypothesis, was the immediate ancestor of man—must exhibit a greater number of structural characters like those of man than any other existing species. The ape, next in affinity, must show the next degree of resemblance, and so on.

If the Gorilla really possesses that exceptional affinity to man with which it is popularly credited, it must exhibit a cluster of structural approximations to man such as are not to be found in any other animal. If, again, there should be reason to think that any anatomical peculiarities have special hereditary significance (either from their not being related to habit, or from the organ in which they are found), then such peculiarities should exist in the Gorilla if it deserves the pre-eminence so commonly attributed to it.

In order to understand the first point to be considered (the Gorilla's zoological position), a few words must be said as to the classification of animals generally.

All the higher animals (from beasts to fishes) are separated off from lower animals (such as insects, worms, and shell-fish), and form by themselves a great group (or sub-kingdom) called VERTEBRATA.* The Vertebrata are divided into five classes:—1. MAMMALIA (beasts). 2. AVES (birds). 3. REPTILIA (reptiles). 4. BATRACHIA (frogs and efts). 5. PISCES (fishes).

Each of these classes is subdivided into a number of subordinate groups termed *orders*, and the class MAMMALIA may be divided into about twelve of such groups.

These are (beginning with the lowest): 1. *Monotremata* (Duck-billed Platypus and Echidna). 2. *Marsupialia* (pouched beasts). 3. *Edentata* (sloths, ant-eaters, &c.). 4. *Ungulata* (hoofed beasts). 5. *Proboscidea* (elephants). 6. *Sirenia* (Dugong and Manatee). 7. *Cetacea* (whales, porpoises). 8. *Carnivora* (flesh-eating

* So called because the animals contained in it always possess a spinal column or back bone, which (except in a few fishes) is made up of a series of separate bony pieces, each of which is called a vertebra.

beasts). 9. *Rodentia* (mice, squirrels, hares, &c.). 10. *Insectivora* (moles, hedgehogs, shrews, &c.). 11. *Cheiroptera* (bats). 12. *Primates.*

The order PRIMATES contains man (zoologically considered) and all the apes and Lemurs; and it is subdivided into two great groups, or sub-orders. The first of these contains man and the creatures most like him (the apes), on which account it has been called *Anthropoidea.* The second sub-order contains the Lemurs proper and the animals most like them, on which account it has been called *Lemuroidea*, the creatures contained in it when spoken of being generally also termed "Half-apes" or "*Lemuroids.*"

The animals contained in these two sub-orders are exceedingly different, respectively, in structure, and there can be no question but that the anatomical differences between man and the lowest apes are very much less than those which distinguish the lowest apes from the highest of the half-apes.

The *Anthropoidea* may conveniently be

spoken of as man and apes, but structurally the group is divisible into three *families*,* the first of which (*Hominidæ*) contains man only (*Homo*).

The apes may be classed in two families (which, however, scarcely differ so much from each other as do the apes, as a whole, from man), which are as neatly distinguished by geographical distribution as by structural differences.

The first of these two ape families is termed *Simiadæ*, and is made up of the apes of the Old World. These are, in fact, almost confined to Africa and Southern Asia, the Rock of Gibraltar and Japan being the northern limits of the group.

The second ape family is called *Cebidæ*, and is exclusively confined to Tropical America.

* Orders (or sub-orders) are always in zoology sub-divided into smaller groups, each of which is termed a *family*, and each family is again sub-divided into smaller and more subordinate groups termed *genera*. Each genera finally is made up of one, few, or many *species*, as the case may be.

FIG. 1.—THE CHIMPANZEE (*Troglodytes*).

The *Simiadæ* are again subdivided into three smaller groups or sub-families:—1. The *Simiinæ* 2. *Semnopithecinæ*; and 3. *Cynopithecinæ*. The first of these sub-families contains the Gorilla, the Chimpanzee, the Orang, and the Gibbons—or long-armed apes. These creatures are the apes which, on the whole, are most like man. They are often therefore emphatically spoken of as the "anthropoid apes," and they are also (on account of the bony structure of their chest) termed the "latisternal" or "broad-breastboned" apes.

The Gorilla and the Chimpanzee together constitute the genus *Troglodytes*. They are both inhabitants of the warmest parts of Western Africa. The Gorilla is much the larger and more bulky animal of the two; but both kinds are vegetarians as to diet, and arboreal in habit. That the Gorilla in external appearance is not pre-eminently man-like may be seen by the Frontispiece herewith given; and a single visit to the British Museum

will serve to convince any unprejudiced observer what a mere brute it is.

The Chimpanzee (Fig. 1) has often been exhibited alive in this country, and is an attractive feature in menageries, not only from its resemblance to a child deformed by preternatural wrinkles of age, but also from its liveliness and the facility with which it acquires a number of playful tricks.

The anatomy of this animal was very accurately described and figured by Tyson in his 'Anatomie of a Pigmie,' published in 1699, and the representation of its external form there given is much better than many which have subsequently appeared.

The Orang (Figs. 2 and 3), which forms the genus *Simia* is exclusively an inhabitant of Borneo and Sumatra, where it attains a considerable bulk, but not equal to that of the Gorilla. Slow, solitary, and peaceful in its habits, the Orang never voluntarily abandons the lowland forests, which supply it at once with shelter and with food.

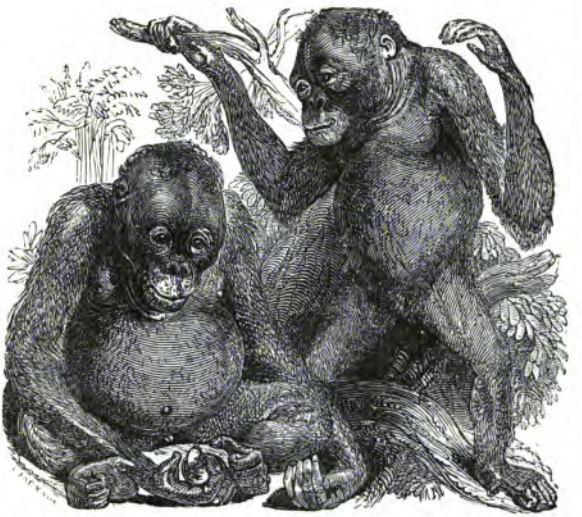

FIG. 2.—THE ORANG (*Simia*) IN IMMATURE CONDITION.

In captivity its deliberation and langour present a marked contrast with the petulant vivacity of the Chimpanzee.

Nevertheless, when attacked it can defend itself with alacrity and effect, as the following anecdote, which Mr. Wallace tells us in his very interesting 'Malay Archipelago,' shows:—

"A few miles down the river there is a Dyak house, and the inhabitants saw a large Orang feeding on the young shoots of a palm by the river side. On being alarmed he retreated towards the jungle, which was close by, and a number of the men, armed with spears and choppers, ran out to intercept him. The man who was in front tried to run his spear through the animal's body, but the Orang seized it in his hands, and in an instant got hold of the man's arm, which he seized in his mouth, making his teeth meet in the flesh above the elbow, which he tore and lacerated in a dreadful manner. Had not the others been close behind, the man would have been more seriously injured, if not killed, as

he was quite powerless; but they soon destroyed the creature with their spears and choppers. The man remained ill for a long time and never fully recovered the use of his arm."

The Gibbons (or long-armed apes) from the genus *Hylobates*, containing several distinct species, the largest and most interesting of which is called the Siamang (Fig. 4).

In external appearance the Gibbons more nearly resemble the Orang than the African *Troglodytes*, on account of the length of the arms, which is even greater than in *Simia*. They are, however, much more active in their habits, though generally gentle in disposition. The power of voice possessed by some kinds is remarkable. The Gibbons, like the two preceding genera, have no vestige of a tail.

The various species of Gibbons are spread over the South Eastern portion of the continent of Asia, and in the Indian Archipelago —as Borneo, Sumatra, and Java. They are all remarkable for their wonderful agility, swinging themselves for prodigious distances

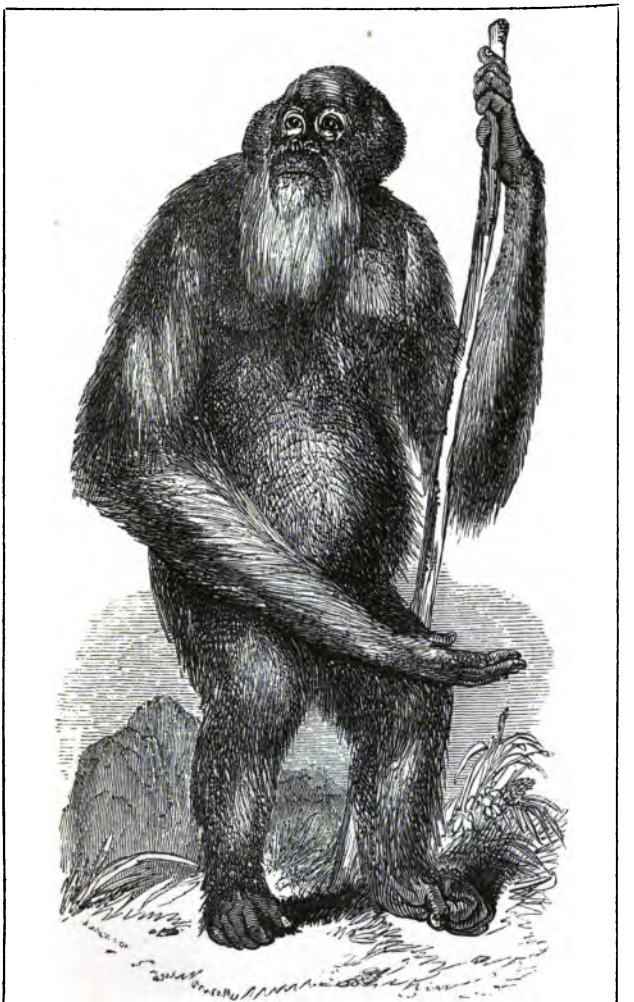

FIG. 3.—THE ADULT MALE ORANG.

FIG. 4.—THE SIAMANG GIBBON (*Hylobates*).

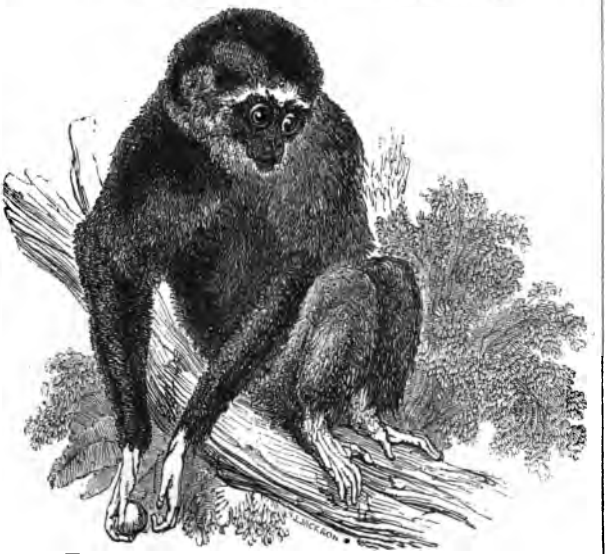

FIG. 5.—THE WHITE-HANDED OR LAR GIBBON.

FIG. 6.—THE SILVERY GIBBON OR WOUWOU.

FIG. 7.—THE ENTELLUS MONKEY (*Semnopithecus*).

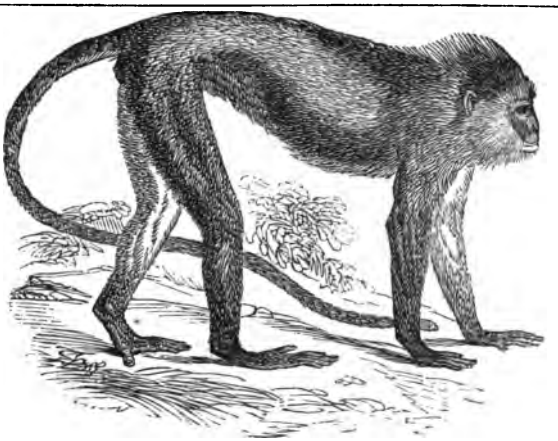

Fig 8.—The Black-crested Monkey.

Fig. 9.—The Moor Monkey.

from bough to bough with great rapidity by means of their enormously long arms, which reach down to the ankle-joint when the body is erect.

The Siamang inhabits Sumatra, and goes about in troops, which morning and evening make the woods re-echo with their sonorous cries.

The white-handed or Lar Gibbon (Fig. 5) comes from Malacca and Siam. It was described and figured by Buffon.

The Silvery Gibbon, or Wouwou of Camper (Fig. 6) is an inhabitant of Java.

The Gibbons differ from the higher *Simiinæ* in that they have the small pads of naked callous skin upon which the body rests when in a sitting attitude. These naked spaces are called *ischial* callosities.*

The second sub-family embraces a number of large long-tailed species of monkeys,

* So called because they cover the lower part of that portion of the haunch-bone which is called the *ischium*. (Fig. 51, a 7).

grouped into two genera. The first of these *Semnopithecus* — of which the Entellus (or Sacred Monkey of the Hindoos) may serve as an example—is entirely confined to Southern Asia (Fig. 7). The *Semnopitheci* have a small thumb on each hand, and are provided with ischial callosities. The arms are shorter than the legs, and their progression on the ground is quadrupedal. They are less active than the Gibbons or most other old-world apes. Gentle when young, they become morose with age.

The largest species is the singular Kahau or Probosis Monkey, an ape of Borneo (Figs. 58 and 59, page 153). The black-crested and Moor monkeys (Figs. 8 and 9) have soft glossy fur.

The animals of this genus are rarely seen in menageries. There are numerous species of a geographical distribution similar to that of the long-armed apes.

The other genus, *Colobus* (remarkable for the absence of the thumb), is as exclusively African. The *Celobi* are like the *Semnopitheci* in form

FIG. 10.—THE WHITE-THIGHED MONKEY (*Colobus*).

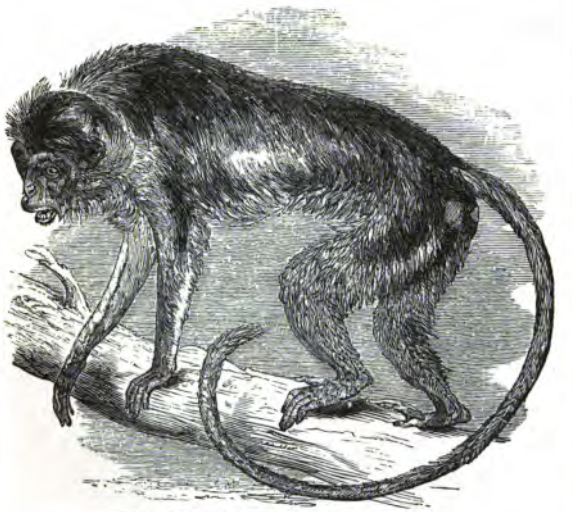

FIG. 11.—TEMMINCK'S COLOBUS.

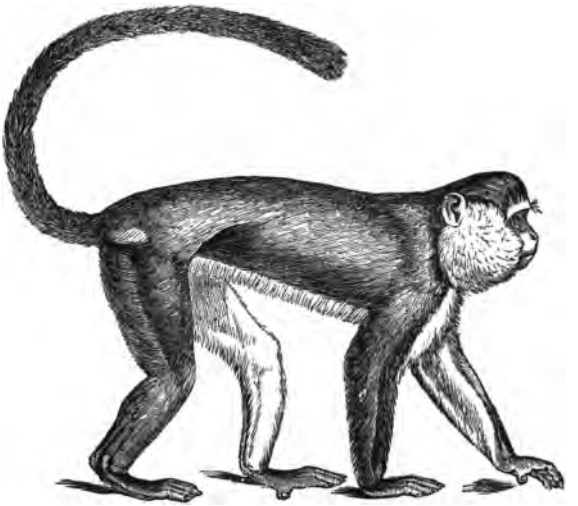

FIG. 12.—THE MONA MONKEY (*Cercopithecus*).

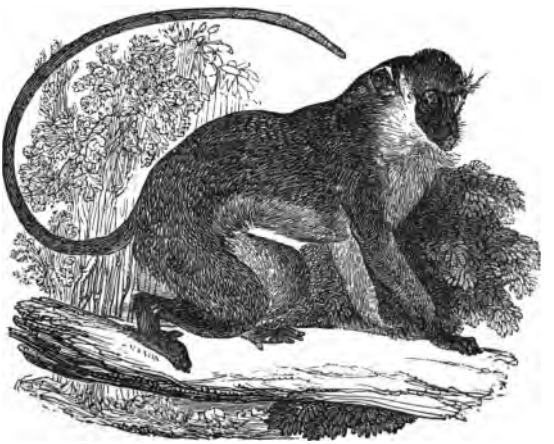

FIG. 13.—THE GREEN MONKEY.

and habit, but their hands (or forepaws) are destitute of thumbs, or have them only in a quite rudimentary condition.

Many of the species are decorated with beautiful fur, so that their skins are an article of commerce, and are often made to cover ladies' muffs. There are various species of *Colobi*.

Temminck's Colobus (Fig. 11) inhabits Sierra Leone. The White-thighed Colobus (Fig. 10), a most beautiful animal, is from the banks of the Gambia.

The third sub-family (*Cynopithecinæ*) contains three genera, namely, *Cercopithecus*, *Macacus*, and *Cynocephalus*. The first of these, *Cercopithecus*, is made up of smaller, long-tailed African monkeys, some of which are very common in our menageries; as are also species of the second and Asiatic genus *Macacus*, in which the length of the tail is different in different kinds. Some of the *Cercopitheci* are very attractive little beasts, and the females and young are often kept as

pets. Such are especially (Fig. 14) the Diana Monkey (so called from its white-crescentic band above the forehead) and the White-nosed Monkey (Fig. 15). Both are inhabitants of the warmer parts of Western Africa.

The Mona Monkey (Fig. 12) is remarkable for its brilliant coloration, its head being yellowish-olive with a black stripe on the forehead, and yellowish whiskers, and a purple face. The back is chestnut brown, and there is a white spot on each side near the root of the tail, which is black.

The Green Monkey (Fig. 13), from the Cape de Verd Islands, is one of the commonest and best known species of the genus.

The White-eyelid Monkeys (Fig. 16) differ in some small characters from the other *Cercopitheci*, so that they have been by some authors placed in a distinct genus. They are also inhabitants of Western Africa.

All the *Cercopitheci* have thumbs pretty well developed; they have also ischial callosities and

FIG. 14.—THE DIANA MONKEY.

FIG. 15.—THE WHITE-NOSED MONKEY.

FIG. 16.—A WHITE-EYELID MONKEY.

FIG. 17.—THE TOQUE (*Macacus*).

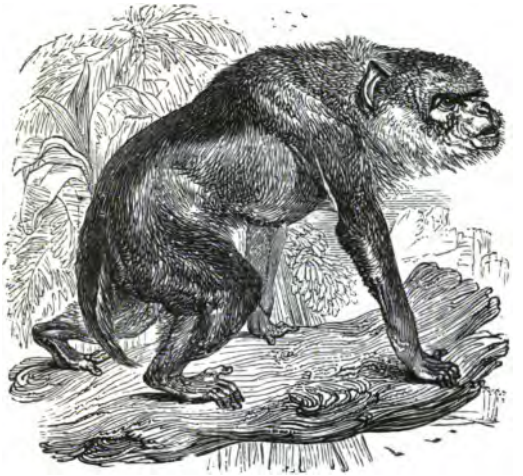

FIG. 18.—THE RHESUS MONKEY.

FIG. 19.—THE WANDEROO.

"cheek-pouches." These pouches are placed one on each side of the mouth, and the animals make use of them as pockets wherein to stow away food for subsequent consumption.

The *Macaci*, or Macaques, are not found in Africa, but they extend farther north than any other monkeys. As it is, two species of this genus (*M. Speciosus* and *M. Inuus*) are respectively found in Japan and at Gibraltar. The Gibraltar ape is pretty closely resembled by an Indian Monkey—the Rhesus—which swarms in many parts of Hindostan (Fig. 18).

Some *Macaci*, as *e.g.*, the Toque (Fig. 17), have a sort of cap of more or less elongated radiating hairs upon their head. The Wanderoo (Fig. 19) has the face encircled by a kind of mane of very long hairs, giving this ape a very conspicuous and distinctive appearance.

All the Macaques have thumbs, cheek-pouches, and large ischial callosities. They are generally less gentle and docile than the

Cercopitheci, and approximate in disposition, as also in appearance, to the next group.

The third genus, *Cynocephalus*, contains the great and brutal Baboons, which are entirely confined to Africa and that part of Asia which is zoologically African—namely, Arabia.

From amongst the species of the genus may be mentioned the Chacma of South Africa and the Drill and Mandrill of Western Africa.

The Chacma (Fig. 20) is remarkable for the elongation of its muzzle. It is a powerful brute, frequenting rocks and living in troops. Its food is mainly vegetables, but it will also eat eggs, and large insects, and scorpions, which it is said to deprive of their sting by a rapid and dexterous pinch.

The Drill (Fig. 22) is a large beast with a black face. The Mandrill (Fig. 21) is one of the largest of the apes, exceeding the Chimpanzee in bulk. It is remarkable for the brilliant coloration of the face, the cheeks being brilliant blue, the nose vermilion, and the beard golden yellow.

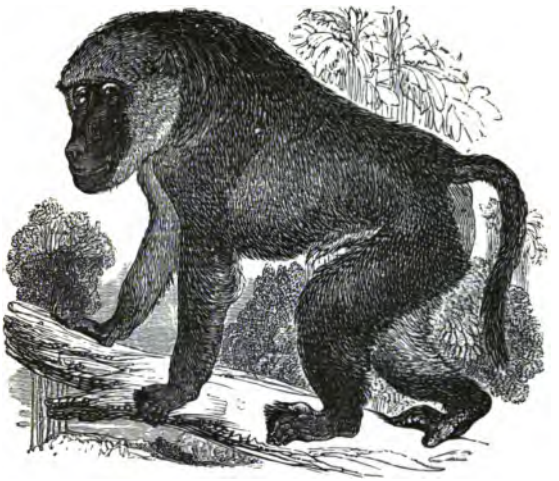

FIG. 20.—THE CHACMA BABOON (*Cynocephalus*).

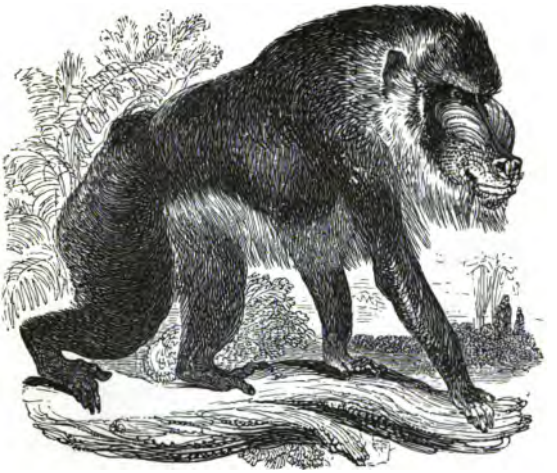

FIG. 21.—THE MANDRILL.

Fig. 22.—The Drill.

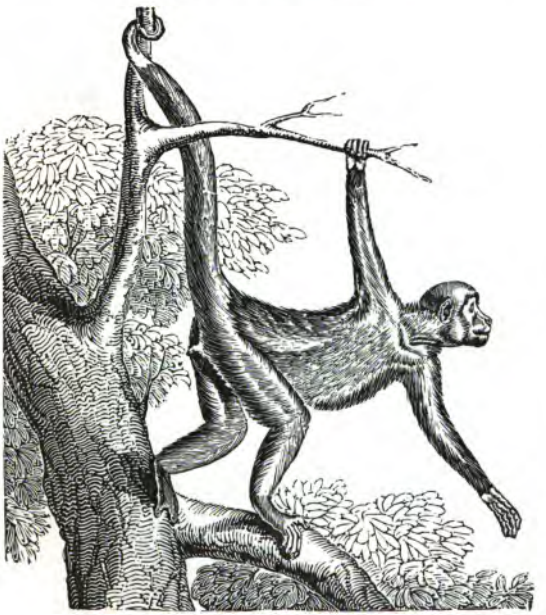

Fig. 23.—The Coaita (*Ateles*).

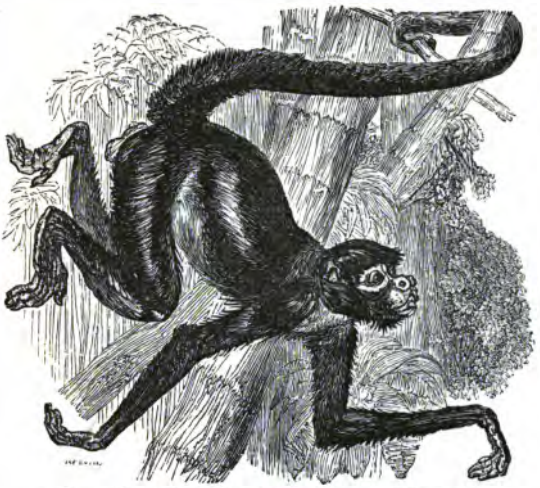

FIG. 24.—THE CHAMECK SPIDER MONKEY.

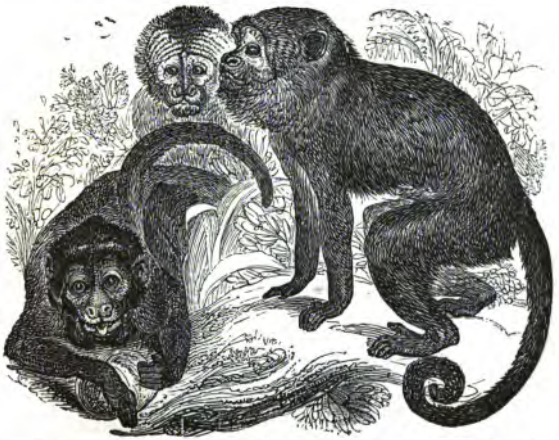

FIG. 25.—THE BROWN SAPAJOU OR CAPUCHIN MONKEY (*Cebus*).

All the Baboons have thumbs and cheek-pouches, and their ischial callosities are very large and conspicuous, being sometimes brilliantly coloured.

The second family of apes, the *Cebidæ*, or monkeys of the New World, form a very distinct group from the *Simiadæ*, and a little experience readily enables an observer to pronounce at a glance that a given ape belongs to the New World without waiting to examine its distinctive characters. They range throughout the Continent of Tropical America, though their headquarters are the forests of Brazil. Strange to say they are absent from the West Indian islands.

All the *Cebidæ* are devoid of ischial callosities and cheek pouches. None have the prominent muzzles of the African baboons, and none attain to so great a bulk as do these latter.

More generally (and for the most part almost exclusively) arboreal than are the apes of the New World, many of the *Cebidæ* are

furnished with a prehensile tail, which serves as an important aid in climbing, and is a structure quite absent throughout the *Simiadæ*.

The apes of the New World also differ in having an extra grinding tooth on each side of each jaw, and in the fact that their thumbs are never opposable like those of the *Simiadæ* and of Man, but bend almost in the same plane with the fingers. Also the septum between the nostrils is broad instead of narrow.

The *Cebidæ* are subdivisible into five smaller groups or sub-families :—1. The *Cebinæ* ; 2. *Mycetinæ* ; 3. *Pitheciinæ* ; 4. *Nyctipithecinæ* ; and 5. *Hapalinæ*.

The sub-family *Cebinæ* contain the genera *Ateles* and *Cebus*.

The Spider Monkeys *Ateles* are, as their name implies, long-limbed and slender, but their hands are as thumbless as are those of the African apes before noticed.

Their long tails are strongly prehensile and naked beneath towards the tip, for more secure prehension. So powerful is their grasp that

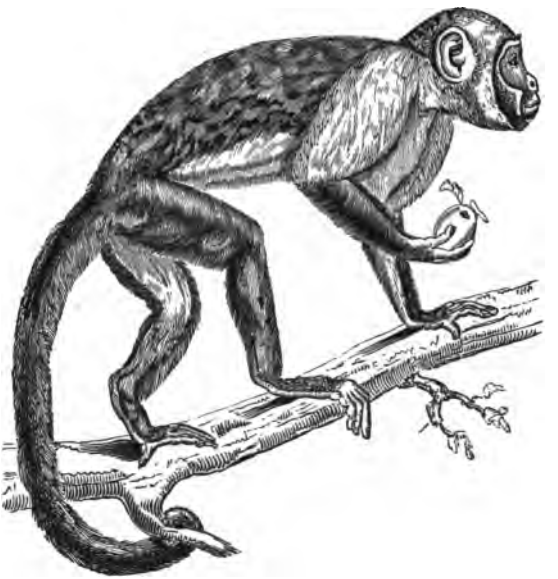

FIG. 26.—THE YELLOW-BREASTED SAPAJOU (*Cebus*).

FIG. 27.—THE RED HOWLING MONKEY (*Mycetes*).

the whole body can be easily sustained hanging by the tail only. It even serves as a fifth hand, grasping and bringing in objects otherwise out of reach.

The Spider Monkeys are very gentle in disposition, and seem by this, by their long limbs and great agility, to represent, as it were, in the New World the Gibbons of the Eastern Hemisphere.

There are various species of Spider Monkeys. Amongst them may be mentioned the Coaita (Fig. 23), which is destitute of every external trace of a thumb; and the Chameck (Fig. 24), in which each thumb is represented by a minute, nailless tubercle.

The commonest American monkeys are the Sapajous (*Cebus*), which are those generally exhibited for their tricks by itinerant Italians. They have long tails curled at the end, but not naked beneath, nor capable of grasping with the power possessed by the tails of the Spider Monkeys.

There are numerous races of Sapajous, but

the individuals vary so remarkably that the number of species has been as yet by no means satisfactorily determined.

The common brown Sapajou, or Capuchin (Fig. 25), and the yellow-breasted kind (Fig. 26) may be mentioned as examples.

The Sapajous make good pets, being both lively and gentle; their voice, moreover, is attractive, having a gentle and pleasing flute-like sound.

The Howling Monkeys (*Mycetes*) are sluggish and, apparently, stupid animals. They have long and very prehensile tails (Fig. 27); but, as their name implies, it is their power of voice which particularly distinguishes them.

They have longish thumbs, and their muzzles are more produced than are those of any other of the *Cebidæ*; so that they may be considered, as it were, to be the Baboons of the New World, as the Spider Monkeys are its Gibbons.

The Howlers are strictly arboreal in their habits, and especially frequent the forests of

FIG. 28.—THE COUXIO (*Pithecia*).

FIG. 29.—A SHORT-TAILED SAKI (*Brachyurus*).

Brazil. Their tail is naked beneath towards its tip, as in the genus *Ateles*.

The second sub-family of American monkeys, the *Pitheciinæ* or *Sakis*, is interesting from peculiarities in the hairy clothing. The tail may be long or short, but is never prehensile.

There are two genera — the long-tailed species, forming the genus *Pithecia*; while the short-tailed species are grouped under the generic designation *Brachyurus*.

One of the species, the Couxio (Fig. 28), is furnished with a magnificent beard; and from its blackness, it has received the specific appellation *P. Satanas*.

Another species, the Yarké, has the head, in the female sex, adorned with elongated hair.

The *Brachyuri* are the only American apes with short tails (Fig. 29), and they are the least arboreal, frequenting bushes rather than trees. They are very timid creatures, and gentle and rather slow in their movements. It is but very rarely that any of the *Pitheciinæ* have been

brought alive to Europe. They have the front teeth of the lower jaw (lower incisors) much inclined instead of standing up vertically, as in the other apes and in man.

The little Squirrel Monkey (*Chrysothrix*)—Frontispiece, Fig. 3—is a singularly attractive and beautiful little animal. Two allied genera are called respectively *Callithrix* and *Nyctipithecus*.

These three genera constitute the sub-family *Nyctipithecinæ*. None of them have prehensile tails. The typical form *Nyctipithecus*, or the Douroucouli, is nocturnal in its habits.

The Squirrel Monkey, or Saimiri, appears to eat insects more readily and greedily than vegetable food.

The last sub-family of American monkeys comprises the delicate little Marmosets (Fig. 30), or Ouistitis (*Hapale*), which differ notably from all the other apes, whether of the Old or New World; so that some authors have purposed to raise them to the rank of a distinct family.

FIG. 30.—A MARMOSET (*Hapale*).

FIG. 31.—THE MARIKINA OR SILKY MONKEY.

They have, like the other American monkeys, the extra grinding tooth on each side of each jaw, but at the same time the hindermost grinder, present both in all the other apes and in man, here disappears.

The great toe is exceedingly small, and each of the five fingers is furnished with long, pointed, and curved claws, while the innermost of the five fingers (the thumb) is not at all opposable to the others.

The tail is not prehensile, but long, and furnished with more or less elongated hairs.

The Marmosets are about the size of Squirrels, or smaller. They are, like Squirrels, active in their motions, and arboreal, living in small troops. They eat fruit and insects, and are very delicate in constitution; so that, though often brought to this country, they generally live but a short time. Nevertheless, they breed here occasionally, and bring forth as many as three at a birth; while all the other apes habitually bring forth but one.

There are numerous species of Marmosets. Several kinds have a long tuft of hair on each side of the head.

One beautiful species, the Marikina or Silky Monkey (Fig. 31), has the fur of golden yellow.

The Ouistitis has little intelligence, and cannot, it appears, be taught the tricks easily learned by other apes.

Passing now to the second sub-order of the Primates, *i.e.*, to the Lemuroids, or Half-apes, we find a geographical distribution of much interest.

The great bulk of the sub-order is exclusively confined to the Island of Madagascar, three genera only being found on the continent of Africa, and not elsewhere, and three others in South Eastern Asia only. In fact, the Lemuroids have a distribution on the earth's surface similar to that of the woolly-haired races of men.

All the Half-apes differ strikingly from the apes in external appearance, but there is much

FIG. 32.—SKULL OF A YOUNG APE (*Cercopithecus*).

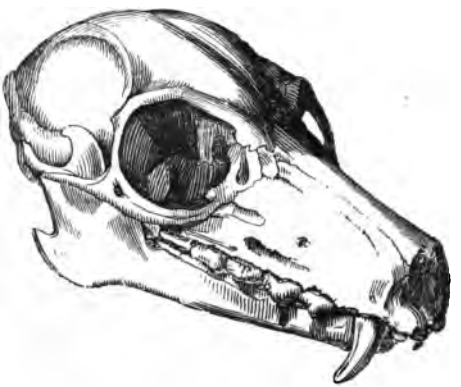

FIG. 33.—SKULL OF A HALF APE (*Lemur*).

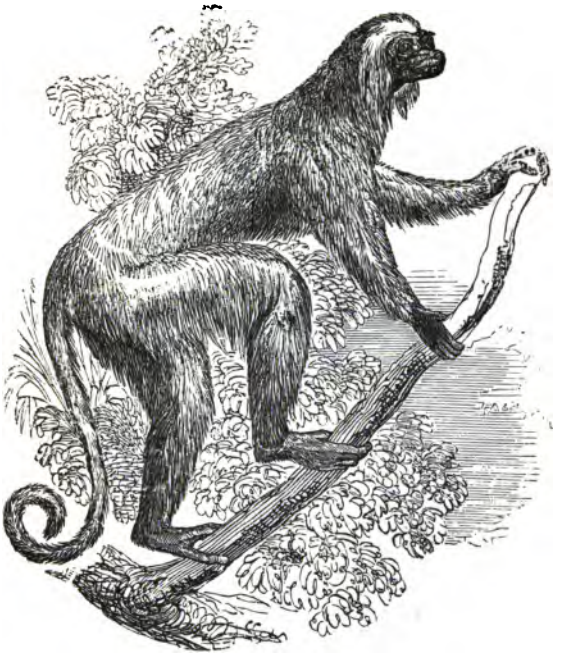

FIG. 34.—THE DIADEM LEMUR (*Indris*).

difference between the different kinds of half-apes themselves.

The difference in external appearance between the apes and half-apes is accompanied by a variety of important anatomical distinctions.*

The sub-order *Lemuroidea* is divided into three families, as in the *Anthropoidea*; but while it is the highest family of the higher sub-order, namely, the family *Hominidæ*, which contains but a single genus, but one genus is found in the two lower orders of *Lemuroidea*, namely, in the *Cheiromyidæ* and *Tarsiidæ*, while the family *Lemuridæ* contains the bulk of the sub-order.

All the Lemuroids eat vegetable food or insects, and all are nocturnal in their habits. None possess a prehensile tail, cheek-pouches, or ischial callosities, and almost always the muzzle is much more produced than in most apes (Fig. 33).

* For details see 'Pro. Zool. Soc.' 1873, May 20th, "On the Zoological Rank of the *Lemuroidea*."

The family *Lemuridæ* is again divisible into four sub-families: (1) the *Indrisinæ*; (2) the *Lemurinæ*; (3) the *Nycticebinæ*; and (4) the *Galagininæ*.

The first sub-family contains various species, all exclusively confined to the island of Madagascar. They are the largest animals of the Lemuroid sub-order. One species is the short-tailed Indris (Fig. 35); another is the Diadem Lemur (Fig. 34), which has a long tail; and a third (to which reference will hereafter occasionally be made) is the Woolly Lemur.

Though some of the just-mentioned species have the word "Lemur" as part of their name, the true Lemurs (*Lemur*), which are the typical Lemuroids, are members of the second sub-family, the *Lemurinæ*.

They have woolly fur, long tails, and pointed fox-like muzzles.

There are numerous species, which present much variety in colouration and arrangement of the fur. As examples, may be mentioned

FIG. 35.—THE SHORT-TAILED INDRI.

FIG. 36.—THE VARI (*Lemur*).

FIG. 37.—THE WHITE-FRONTED LEMUR.

FIG. 38.—THE SLOW LEMUR (*Nycticebus*).

the ruffed Lemur, or Vari (Fig. 36), and the white-fronted Lemur (Fig. 37).

Lemurs are very common animals in menageries, and live fairly in confinement. They make agreeable pets, though their powerful eye-teeth render an accidental bite no slight infliction.

They are exclusively natives of Madagascar, as also are the other two genera of this sub-family, *Hapalemur* and *Lepilemur*—the last-mentioned genus being the only one of the three which is furnished with a tail shorter than the body.

The species belonging to the third sub-family constitute a curious group of slow-paced, tailless, or short-tailed Lemuroids (*Nycticebinæ*), and contains two African and two Asiatic genera. The African genera are the Potto (*Perodicticus*), and the Angwántibo (*Arctocebus*) (see Frontispiece, Figs. 4 and 5). The Asiatic genera are the Slender Lemur (*Loris*) (Fig. 39) and the Slow Lemur (*Nycticebus*) (Fig 38).

In all these four genera the forefinger of

each hand is short, but in the Potto it is reduced to a minute rudiment, so that each hand is but three-fingered.

All possess a very tenacious grasp, and by a special arrangement of the muscles and tendons the mere stretching of the leg causes the toes to flex and embrace tightly any object placed within their grasp. In this way the dead body may be securely suspended by the weight of the trunk extending the legs.

These animals devour not only eggs and insects, but also birds, in addition to fruit.

The fourth sub-family (*Galagininæ*) contains two genera—one an exclusively Madagascar type, the other as exclusively peculiar to the continent of Africa.

Both have the ankle elongated in a remarkable degree and in a peculiar manner, described below (Fig. 53) with the rest of the skeleton.

The Madagascar genus is called *Cheirogaleus.*

The other genus of the sub-family is called

FIG. 39.—THE SLENDER LEMUR (*Loris*).

FIG. 40.—THE MAHOLI GALAGO (*Galago*).

Galago (Fig. 40). It is a singular and beautiful genus, widely distributed over the continent of Africa, and containing many species. They have, as just remarked, feet of very peculiar construction, are very active in their movements, and great leapers.

Another genus of Half-apes is so exceptional as to form a family by itself (*Tarsiidæ*). It is the Tarsier (*Tarsius*). These little animals inhabit the Islands of Celebes and Borneo, and have a foot of the Galago type, but still more exaggerated (Frontispiece, Fig. 6).

The last genus of the sub-order, which also ranks as a family called *Cheiro-myidæ*, is the Aye-Aye (*Cheiromys*). This very remarkable animal (Frontispiece, Fig. 7) was discovered by Sonnerat in Madagascar, in 1780, and was never again seen till 1844, when a specimen was forwarded to Paris. It is now represented in our national collection by two stuffed specimens and by a skeleton; and there is also a skeleton in the Museum of the

Royal College of Surgeons. The Aye-Aye is said to live on grubs which infest trees beneath the bark. The Tarsier and the Aye-Aye are the two animals which depart most widely from the general type of organization prevalent in the order Primates.

Thus it becomes evident that the position of the Gorilla is in the African group, of the latisternal sub-family, of the Old World ape family, of the Anthropoid division of the order Primates. This is the answer to the first of the three questions proposed.

The various groups of Primates may be tabulated as follows :—

SUB-ORDER I.—ANTHROPOIDEA.

Family I.—Hominidæ		Homo.
Family II.—Simiadæ	1. *Simiinæ*	Troglodytes.
		Simia.
		Hylobates.
Sub-family.	2. *Semopithecinæ*	Semnopithecus.
		Colobus.
	3. *Cynopithecinæ*	Cercopithecus.
		Macacus.
		Cynocephalus.
Family III.—Cebidæ	1. *Cebinæ*	Ateles.
		Cebus.
	2. *Mycitinæ*	Mycetes.
Sub-family.	3. *Pitheciinæ*	Pithecia.
		Brachyurus.
	4. *Nyctipithecinæ*	Callithrix.
		Chrysothrix.
		Nyctipithecus.
	5. *Hapalinæ*	Hapale.

SUB-ORDER II.—LEMUROIDEA.

Family IV.—Lemuridæ.	*Indrisinæ*	Indris.
	Lemurinæ	Lemur.
		Hapalemur.
		Lepilemur.
Sub-family.	*Nycticebinæ*	Nycticebus.
		Loris.
		Perodicticus.
		Arctocebus.
	Galagininæ	Cheirogaleus.
		Galago.
Family V.—Tarsiidæ		Tarsius.
Family VI.—Cheiromyidæ		Cheiromys.

PART II.

THE second and more interesting question now follows: "What are the degrees of resemblance to man which the various kinds of apes exhibit?"

It may be well to begin with what is most manifest and external—the hair. All the apes and all the Half-apes agree together, and differ from man in having the body almost entirely clothed with copious hair, and especially in never having the back naked. The postero-inferior part of the body is indeed conspicuously naked, and the skin there thickened, in the Baboons and long-tailed monkeys of the Old World. But the presence of such ischial callosities can hardly

be approximation to the nakedness of man, since both in *Simia* and in *Troglodytes* they are wanting, while in *Hylobates* they are exceedingly small. On the other hand, the *absence* of these dermal thickenings in the Orang, Chimpanzee, and Gorilla is no especial mark of affinity to man, since they are equally absent in all the American apes and in all the Lemuroids.

One of the most grotesque conceptions suggested by Mr. Darwin is that the nakedness of man, and especially of woman, has been produced by the gradual extension over the body (through the persistent choice of more and more hairless spouses) of an incipient local nakedness like that now existing in certain apes.* No facts known to the author afford the slightest basis for this bizarre hypothesis.

No single ape or Lemuroid has so exclusive and preponderating a development of hair on the head and face as exists in most men. As to the head, long hair thereon is not a

* See "Descent of Man," vol. ii. p. 377.

character found in the highest apes, but rather in the *Semnopitheci*, and in forms approaching the Baboons. As to the face, a beard and copious whiskers are not unknown amongst apes. The male Orang (Fig. 3) has a beard, and certain *Cercopitheci* (*e.g.*, the Diana Monkey, Fig. 14) have long hair on the cheeks and chin. Nevertheless, it is not in the highest apes, nor even in the higher family, that we find a luxuriance in this respect like what we may often find in man. We must go for such luxuriance to the New World apes—to the Sakis (see Fig. 28), which are certainly not the highest forms even of their own family, and which indeed show a certain resemblance (*e. g.*, in their teeth) to the Lemuriod sub-order.

The opposed directions of the hair on the arm and forearm respectively (the apices converging to the elbow) is the same in most latisternal apes as in man. Nevertheless, in at least one such ape (*H. agilis*) the hair of the whole limb is directed uniformly towards

the hand, as in most lower species. Yet we find it in some of the *Cebidæ* as in man.

Passing to the solid structures which the hair clothes, we come to one of the most characteristic peculiarities of the human body.

The whole of the apes and the whole of the Half-apes agree together, and differ from man in having the great toe, or (as it is called in anatomy) the hallux, so constructed as to be able to oppose the other toes (much as our thumb can oppose the fingers), instead of being parallel with the other toes, and exclusively adapted for supporting the body on the ground. The prehensile character of the hallux is fully maintained even in those forms which, like the Baboons, are terrestrial rather than arboreal in their habits, and are quite quadrupedal in their mode of progression.

It was this circumstance that led Cuvier to give to that separate order in which he places man alone, the name *Bimana*, while on the order of apes and Lemurs he imposed the term *Quadrumana*.

The dispute as to whether the latter term is or is not applicable to the apes seems rather a dispute about words than about material objects.

If we accept, with Professor Owen, as the definition of the word "foot," "*an extremity in which the hallux forms the fulcrum in standing or walking*," then man alone has a pair of feet. But, anatomically, the foot of apes agrees far more with the foot of man than with his hand, and similarly the ape's hand resembles man's hand and differs from his foot. Even estimated physiologically, or according to use, the hand throughout the whole order remains the prehensile organ *par excellence*, while the predominant function of the foot, however prehensile it be, is constantly locomotive. Therefore the term *Quadrumana* is apt to be misleading, since anatomically as well as physiologically both apes and man have *two hands and a pair of feet*.*

The thumb, in anatomy the pollex, shows

* See 'Phil. Trans.' 1867, p. 362.

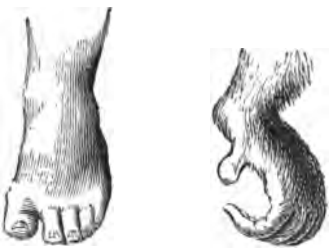

FIG. 41.—FOOT OF MAN AND OF THE ORANG.

no similar uniformity of condition. In the most man-like apes it is relatively much smaller than in man, and the Lemurs are more man-like than the apes in the development of this member.

As we have seen, the latisternal apes are, like man, devoid of a tail. A similar resemblance is, however, presented by much lower forms, as *e.g.*, by the ape of Gibraltar, and even in the Slender Lemur (*Loris*) (Fig. 39).

As we descend from man, when we first encounter a tail at all, we find it at almost its maximum of development in the whole order, for such is its condition in the *Semnopithecinæ*. Short tails exist in the most varied forms from *Macacus* to *Arctocebus*; but a prehensile tail is found nowhere in the order *Primates*, save amongst the genera of the American continent.

The commoner monkeys of the Old World (the *Cynopithecinæ*) have the cheeks peculiarly distensible, serving as pockets. In so far as

the higher apes resemble man in the absence of this condition, they share that resemblance with all the lower forms of the order, since no cheek-pouches exist in the *Cebidæ* or in any of the *Lemuroidea*.

Passing now to internal anatomy, it will be well to dwell with care on the characters presented by the skeleton. Without a patient consideration of many details, it will be impossible to arrive at any sure result as to the question under consideration, or as to that which is to follow. Hasty conclusions, derived from a few characters only, will be certain to mislead us in any investigation of the teaching of nature with respect to the affinities of organised beings.

The back-bone of man exhibits a beautiful sigmoid curvature, and is strongly convex in front in the lumbar region. Now it is not in the latisternal apes, but in some of the Baboons, that we meet with the nearest resemblance to man in this particular.

The lumbar region of the back-bone ex-

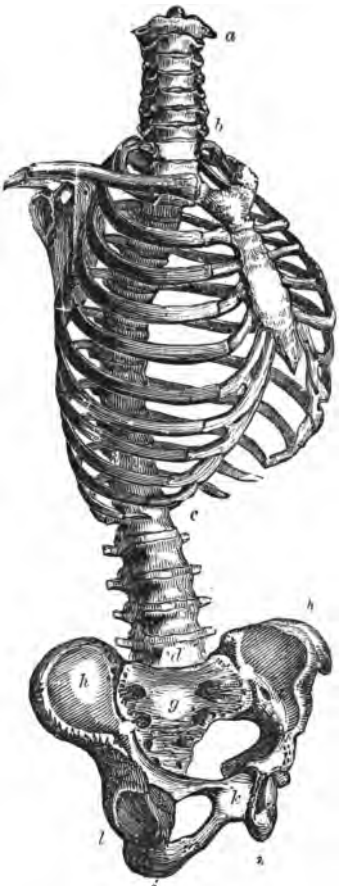

FIG. 42.—SKELETON OF THE TRUNK OF MAN.

a b, the seven neck bones, or cervicle vertebræ; *c d*, the five bones of the loins, or lumbar vertebræ; *g*, the sacrum; *h*, the hip-bone or ilium; *i*, the ischium; *k*, the pubis; *l*, the thigh socket or acetobulum.

hibits in most apes certain bony prominences,* which are rudimentary in man. The three highest genera resemble man in this respect, but the same resemblance is found in the Slender Lemur (*Loris*) and in closely allied forms.

The sacrum† of man (Fig. 51, B) is also nearly as much resembled (size not being considered) by that of *Loris* as by those of the highest apes. Again, in the angle which this bone forms with the lumbar part of the back-bone, man is most resembled, not by the highest apes, but by some Baboons. The same may be said respecting the concavity of the anterior surface of the sacrum; and of the three highest genera it is not the Gorilla and Chimpanzee which resemble man most nearly, but the Orang.

The hinder aspect of the back-bone exhibits

* Termed "Metapophyses" and "Anapophyses." For details as to these see 'Pro. Zool. Soc.' 1854, pp. 571-576.

† The "sacrum" is the large and solid piece of the back-bone to which the haunch-bones are attached.

a number of prominences termed spinous processes. These, in most apes, are differently directed towards the two ends of the series, so that they tend to converge towards a single point in the back. They do *not* do so in man and the latisternal apes, but neither do they in *Loris* and its allies (*Nycticebinæ*). In that the breast-bone, or sternum, is relatively short, and composed but of two bones, man agrees not so much with *Troglodytes* and *Simia* as with the Gibbons; and in the Siamang the sternum is even shorter and broader relatively than in man.

The Orang exhibits a singular peculiarity in that the breast-bone long remains made up of ossifications arranged in pairs, side by side, successively (Fig. 49).

The normal number of ribs in the Gorilla and Chimpanzee is thirteen pairs; in the Orang and some Gibbons it is twelve, as in man.

In the Orang and Gibbons there are, as in man, five lumbar vertebræ; in the Gorilla

and Chimpanzee there are but four, and sometimes only three.

The bones of the neck (cervical vertebræ) in man have but short spinous processes, while in the Orang and Gorilla these are enormously elongated. It has been proposed to account for this latter condition by the great weight of the head and jaws in these apes. The little group *Nycticebinae*, however, presents us with a parallel diversity, though the head and jaws are about equally developed in all of them. These spines are quite short in *Loris* and *Nycticebus*, while they are prodigiously long in *Perodicticus* and *Arctocebus*.

The skull of man presents in the frontal region an elevated and rounded contour, very different from what we find in the apes generally, and notably in the higher family of them. It is in the American forms—especially in *Callithrix* and *Pithecia*—that we find the greatest resemblance to man in this respect. It is in the Gorilla that great bony crests (for muscular attachment)—like those

of a carnivorous animal—attain their maximum of development. Frontispiece, Fig. 2.

The relation of the face to the brain-case is shown by what is called the cranio-facial angle. This angle is estimated by comparing the direction of a line drawn parallel to the base of the skull with another line drawn from the front end of that base to the middle of the lower margin of the upper jaw. Stress has been laid on the difference existing between man and the Gorilla as to this angle. But it does not appear to be a really important character, since much difference exists with regard to this character in forms admitted by all to be closely related, such as the two Baboons—the Mandrill and the Chacma.

There is one small cranial character, however, in which the Gorilla approaches man more nearly than does any other Primate. This is the existence of a certain ridge (termed *vaginal*) on the under surface of the bone which encloses the internal ear. Another process of the same bone (called

FIG. 43. - SKULL OF MAN.

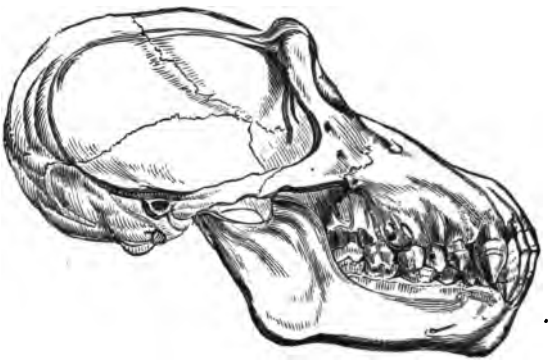

FIG. 44.—SKULL OF CHIMPANZEE.

FIG. 45. SKULL OF ORANG.

styloid) is, however, sometimes developed more in accordance with man in one of the Baboons than in any other Primate; while of the latisternal apes it is not the Gorilla, but the Orang, which in this matter is the most human.

The Gibbons are more human than the Orang, Chimpanzee, or Gorilla as to the preponderance of the brain-case of the skull over the bony face. But the smaller American monkeys exceed the Gibbons in this respect, while the Squirrel Monkey exceeds even man himself.

A striking feature in the human skull is the prominence of the inferior margin of the lower jaw in front; *i.e.*, the presence of a "chin." The feature is quite wanting in the Gorilla, as also in the Orang and Chimpanzee. A more or less developed "chin," however, exists in the Siamang, although no other species of Gibbons, and indeed no other ape or Lemuroid, shows us a similar condition.

Another marked character of man's skull is

the projection and transverse convexity of the bones of the nose. This convexity is quite absent in the Chimpanzee and in most Gibbons. In the Orang these bones are exceedingly small and flat, often even uniting into one bone, or with the adjoining jaw-bones, if indeed they are not altogether absent.

In the Gorilla, on the other hand, they are slightly convex transversely at their upper part, so that here we seem to have evidence of the predominant affinity of the Gorilla to man. Further examination, however, shows that this character can have no such meaning, since a still more decided convexity is found to exist in some *Semnopitheci*, and even in the lowest Baboons. Moreover, in these Baboons the nasal bones only become convex towards maturity, being at first flat. This character therefore can hardly have been at one time a general one, now preserved only in a few scattered forms.

The relative length of the arm and hand, when compared with that of the spine, is very

different in all the latisternal apes from what exists in man. In this respect the Gorilla is less like man than is the Chimpanzee, though both are less unlike him than are the Orang and Gibbons. In the Gibbons the arm and hand attain about twice the relative length attained in us.

The analogous proportions of the leg and foot show a near agreement between the Orang and man. While the Gibbons and Spider Monkeys have relatively longer legs than we have, the Gorilla and Chimpanzee have much shorter ones. If the foot be excluded from the calculation, then the Orang differs the most from man, while the Gibbons exhibit a remarkable conformity to him.

In shape the blade-bone of the Gorilla is singularly like that of man, but that of its congener, the Chimpanzee, differs more from man than does that of the Orang.

The collar-bone, in both the Chimpanzee and Gorilla, is much shorter when compared with the blade-bone than it is in man. In the

Gibbons, however, it is still larger than in him; while in the Orang its relative length is much as in man.

Both the bone of the upper arm (*humerus*) and the bones of the fore-arm (*Radius* and *Ulna*) in the Chimpanzee, when compared in length with the spine, more resemble the same bones in man than do those of any other latisternal ape. In the length of the hand, so estimated, the Gorilla is the most human, and it is so in the relative length of the fore-arm bones to the humerus.

Much has been said of late as to a certain perforation (*Supra condyloid foramen*) which has been found in a certain number of ancient human skeletons. Some have supposed this circumstance to indicate a transition in human structure from that of the higher apes. In fact, however, it is not in the Gorilla, nor in any of the latisternal apes, nor even in any of the apes of the Old World, that we find such a perforation normally developed. Such a condition is not met with till we descend to the

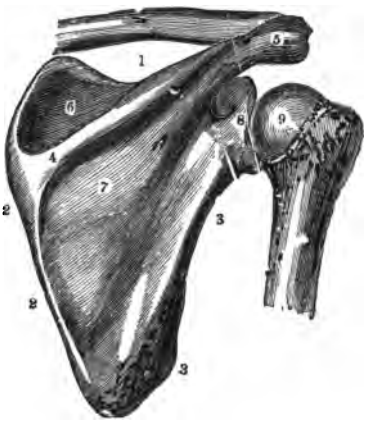

FIG. 46.—BLADE-BONE OF MAN WITH PARTS OF HUMERUS AND COLLAR-BONE.

1, 2, and 3, its three borders; 4 and 5, its spine and acromicon process; 6 and 7, supra and infra-spinous fossæ; 8, socket for 9, head of humerus.

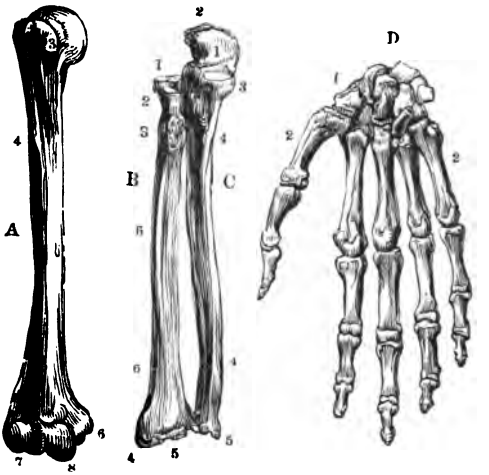

FIG. 47.—BONES OF MAN'S ARM AND HAND.

A. Humerus: 4, shaft; 6, internal condyle; 7 and 8, surface for radius and ulna. B. Radius: 1, surface for humerus; 2, neck; 3, tubercle; 4 and 5, surface for wrist-bones; 6, shaft. C. Ulna: 1–3, sigmoid cavity for humerus; 4, shaft; 5, styloid process. D. Bones of the hand: 1, The eight bones of the wrist; 2–2, The five metacarpal bones, that of the thumb supporting two other bones (phalanges), each of the others supporting three such bones.

lower *Cebidæ* (from *Cebus* downwards), though, with the exception of *Arctocebus*, it is constant in the Half-apes.

The little bones of the wrist are in man only eight in number, arranged in two transverse series.

The bones of the upper, or proximal row, are: (1) the *scaphoides* (or scaphoid bone); (2) the *lunare* (or semi-lunar bone); (3) the *cuneiform* (or wedge-shaped bone); and (4) the *pisiform* (or pea-shaped bone).

The bones of the lower, or dictal row, are: (1) the *trapezium*; (2) the *trapezoides*; (3) the *magnum*; (4) the *unciform*.

The magnum is the largest bone of the dictal series, while the unciform articulates with and supports two metacarpals, namely, the fourth and fifth.

The trapezium presents a saddle-shaped surface to the first long bone (*metacarpal*) of the thumb, being concave in one direction and convex in another.

In almost all the other Primates there are

nine of such ossicles, an extra bone, called the *intermedium*, being interposed between the *Scaphoides*, the *Trapezoides*, and the *Magnum*. In the Gorilla and Chimpanzee there are but eight, while the Orang and Gibbons have, like the other monkeys, nine. It is very remarkable that amongst the Lemuroidea we find certain forms, namely, *Indris* and *Lepilemur*, which agree with *Homo* and *Troglodytes* in having but eight bones to the wrist. One of these wrist-bones (the *Pisiform*) is much smaller relatively in man and in the Orang than in almost any other species of the order. Strange to say, however, we find in the little slender Lemur (*Loris*) an approximation in this respect to man much beyond that exhibited by the Gorilla.

The thumb, as to its relative length, taking again the back-bone as our standard of comparison, is in the Gorilla more like that of man than is the thumb of any other of the *Simiinæ*. But the same degree of resemblance to man exists in many lower forms; and in

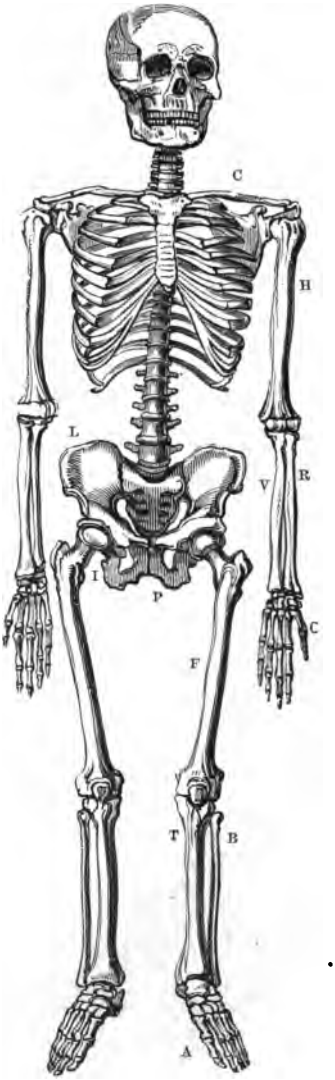

FIG. 48.—SKELETON OF MAN.

A, hallux; B, fibula; C, clavicle; F, femur; H, humerus; I, ischium; L, hip-bone or ilium; O, pollex; P, pubis; R, radius; T, tibia; V, ulna.

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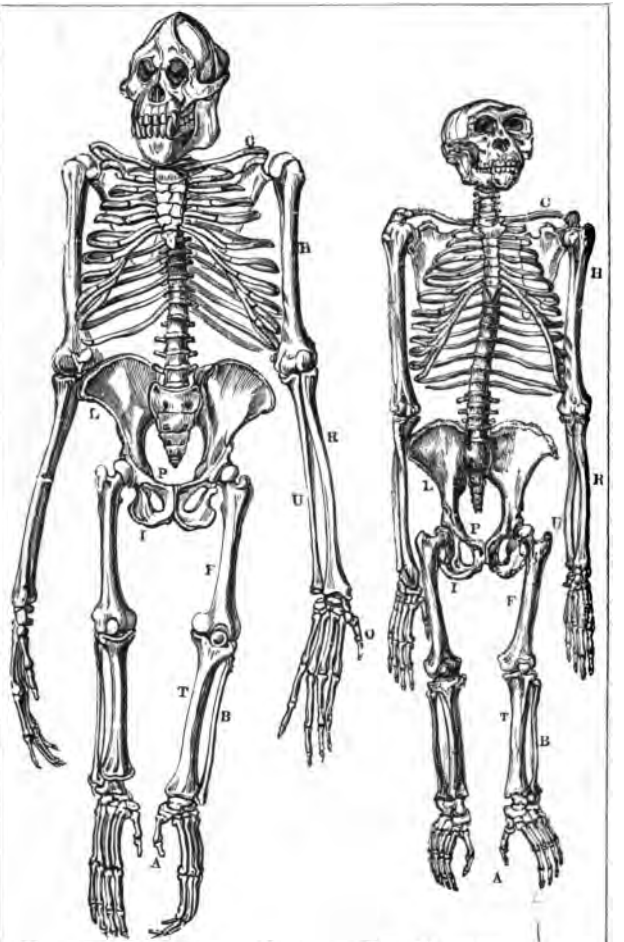

FIG. 49.—SKELETON OF ORANG. FIG. 50.—SKELETON OF CHIMPANZEE.

A, hallux; B, fibula; C, clavicle; F, femur; H, humerus; I, ischium; L, hip-bone or ilium; O, pollex; O, pollex; P, pubis; R, radius; T, tibia; U, ulna.

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the short-tailed Indris the proportion is precisely the same as in ourselves.

The very same remarks may be applied to the index finger also.

The proportion borne by the thumb to the longest finger of the hand in the Gorilla is slightly more human than what we find in any other latisternal apes. Nevertheless the difference between these apes is trifling, and all differ greatly from man in this proportion; while in the slender Lemur, and in the Marmoset, the proportion is nearly as it is in us, although in the Marmoset the thumb is not, as in us, opposable.

The pelvis, consisting of the two haunch-bones and sacrum, is one of the most characteristic parts of the human skeleton, closely connected as is its shape with the upright posture of man's body.

In the breadth of the pelvis (Fig. 42), compared with the extreme length of each haunch-bone, man greatly exceeds every other Primate; he is most nearly approached, however, in this

respect, not by the Gorilla, but by some of the Gibbons.

In the breadth of the pelvis, compared with its extent from before backwards, man is more nearly reached by some Baboons than by any latisternal ape.

The haunch-bone (*os innominatum*) is made up of three bones—1, the *ilium*; 2, the *pubis*; and 3, the *ischium*—which have coalesced into one mass (Fig. 51, A).

In the length of the whole mass, compared with that of the spine, the Gorilla, Chimpanzee, and Orang are considerably less human than are the Gibbons. In the relative length of the crest of the ilium, however, the Orang takes precedence.

Each ischium ends below in what is called its "tuberosity," on which the body is supported when in a sitting posture. Above this tuberosity is a prominence called the "spine of the ischium" (Fig. 51, A 9).

The shortness of the ischia, the smallness and the non-eversion of the tuberosities, and

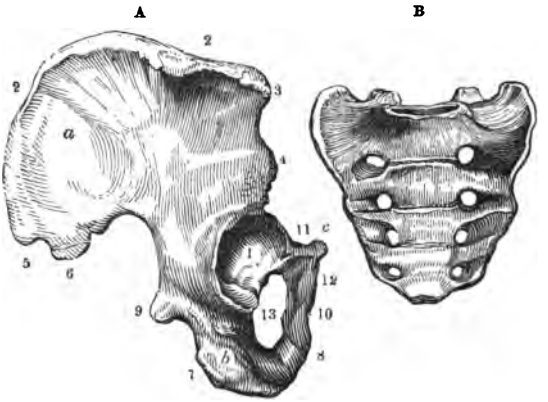

FIG. 51.—HAUNCH-BONE AND SACRUM OF MAN.

A, Haunch-bone (*os innominatum*): *a*, ilium; *b*, ischium; *c*, spine of pubis; 1, acetobulum; 2, crest of ilium; 3, 4, 5, and 6, iliac spinous processes; 7, tuberosity of ischium; 8, ramus of ischium; 9, spine of ischium; 10, 11, and 12, ramus of pubis; 13, obturator foramen.

B, Sacrum: its anterior surface.

the prolongation of the latter upwards nearly to the spines of the ischia, are four characters almost peculiar to man. He is most nearly approached in these points, not by the Gorilla, nor by any of the *Simiinæ*, but by the Slender Lemur (*Loris*).

The development of the spine of the ischium is much more human in the Orang than either in the Chimpanzee or Gorilla.

The length of the thigh-bone (*femur*) compared with that of the back-bone, is greater in man than in any latisternal ape. He is most nearly approached in this respect by the Spider Monkeys (*Ateles*), while in the Gibbons it is even longer than in man.

Comparing the length of the thigh-bone with that of the haunch-bone, we find the short-tailed Indris to be the most human, while *Hylobates* is more so than are the higher genera of *Simiinæ*.

In man the relative length of the thigh-bone to the humerus is enormously greater than in any latisternal ape. The Lemurs

approach us most nearly in this proportion, while, as regards the slenderness of the thigh-bone, the Gibbons agree with us much more than do the thick thigh-boned Orang, Chimpanzee, and Gorilla.

The "neck" of the thigh-bone (Fig. 52, A. 2) is especially long and well defined in man and in the latisternal apes, but the Gorilla in this respect is the least human of the latter.

The lower end of the thigh-bone of man is distinguished by the much greater projection downwards of its inner part (*inner condyle*). It are not, however, the *Simiinæ*, but the Spider Monkeys, and some Baboons, which in this character present the nearest resemblance to ourselves.

The length of the shin-bone, compared with that of the back-bone, is greater in man than in any of the Old World apes, except the Gibbons, in which its relative length is even a little greater than in man. Some of the Spider Monkeys resemble him in this more than do any other Primates.

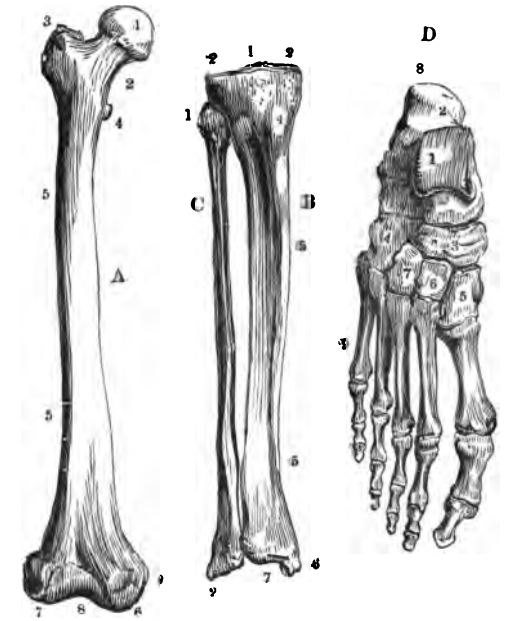

FIG. 52.—BONES OF MAN'S LEG AND FOOT.

A, Thigh-bone or Femur: 1, its head; 2, neck; 3 and 4, trochanters; 5, shaft; 6, inner condyle; 7, outer condyle; 8, surface for tibia; 9, tuberosity above inner condyle.

B, Tibia: 1, and 2, surface for femur; 4, tuberosity; 5, shaft; 6, internal malleolus; 7, horizontal surface for ankle of.

C, Fibula: 1, head; 2, distal end or external malleolus.

D, Bones of Foot: 1, astragalus; 2, calcaneum; 3, naviculare; 4, cuboides; 5, internal cuneiform bone; 6, middle cuneiform bone; 7, external cuneiform bone.

The length of the shin-bone compared with that of the thigh-bone is much the same in the Gorilla and Chimpanzee as in man. In the Gibbons it is rather longer, relatively, and in the Orang considerably longer. In the Slow Lemur, however, the proportion is almost as human as in the Gorilla.

When the length of the entire foot is compared with that of the back-bone, the Orang appears at much disadvantage (as to resemblance to man) in comparison with all the other latisternal apes; the Baboons, however, excel the last-named animals in this respect.

When the length of the foot is compared with that of the entire leg without it, the Gibbons are seen to take precedence (as to human likeness), not only of all the other latisternal apes, but of all other Primates whatever, except the *Nycticebinæ*.

If the length of the foot be compared with that of the shin-bone, the Gibbons come absolutely to the front rank of the whole order, while the Orang is seen to be, in this

respect, the most inhuman of all Primates. The proportion as to length borne by the foot to the hand is more human in the short-tailed Indris than in any other Primate; while, of the latisternal apes, the Gibbons are the least human, and the Orang the most so; the last named, however, not being nearly so human as is the short-tailed Indris.

The ankle-bones form what is called the *tarsus*, and are seven in number, namely, the *astragalus*, *calcaneum*, *cuboides*, *naviculare*, and three cuneiform bones.

None of them can ordinarily be called "long bones." The *astragalus* receives the weight of the trunk from the shin-bone; the *calcaneum* (or *os calcis*) forms the prominence of the heel.

In the genera *Galago*, *Cheirogaleus*, and especially in *Tarsius*, the *os calcis* and *naviculare* are so extraordinarily produced as to become "long bones"—thus adding another segment to the limb.

In man the ankle-bones form a larger

FIG. 53.—A, TARSUS OF CHIEROGALEUS. B, TARSUS OF GALAGO.

1, Astragalus; 2, calcaneum; 3, naviculare; 4, cuboides; 5, 6, 7, cuneiform bones.

proportion of the entire foot than in any other Primates except in the *Galagininæ*. As to this point the Gorilla and Chimpanzee are considerably more human than are the Gibbons and Orang. In the man-like slenderness of the ankle, however, some Gibbons much more approximate to man than do the other latisternal apes.

In the relative length of the great toe (*hallux*), compared with that of the back-bone, man is very closely approximated by the Gorilla, while the Orang falls off greatly. In this pre-eminence, however, the Gorilla is about equalled by some of the Sakis of America.

In the proportional length of the longest toe to the back-bone, man is most nearly approached by the Gorilla and Chimpanzee amongst the latisternal apes. He is, however, much *more* nearly approached by the Lemurs. In man, the great toe much more nearly equals the longest toe in length than in any other Primate. The Chimpanzee is the most

human in this matter, but the short-tailed Indris is almost as much so, and excels the Gorilla and all other latisternal apes. The great toe of the Orang differs from that of every other Primate in that the terminal joint is often absent.

In the proportion borne in length by the great toe to the entire foot, man is most closely resembled by the Gibbons and Chimpanzee, while the Orang is the least human of all Primates. In the diminutive development of the hallux, as compared with the pollex, the Orang is even more exceptional, though an approximation to this is found in the lowest of apes—the Marmosets. In the proportion borne by the hallux to the pollex, man and the Gorilla agree; then comes the Chimpanzee; then the Gibbons, and, last of all, the Orang. The Little Squirrel Monkey, however, is almost as human as the Gorilla in this proportion.

Such are the main affinities towards man's structure exhibited by the different kinds of

the higher apes as regards the skeleton. They show that the various species approximate to man, not only in different degrees, but also in different modes. The Orang, certainly, diverges more, as regards the skeleton, from man, than does any other latisternal ape.

Thus it has the shortest leg, compared with the arm, of all Primates (hand and foot not being counted), while man has the longest. It has the absolutely longest hand and the shortest thumb, as compared with the forefinger; and it has the shortest thigh-bone, compared with the upper arm-bone, of all Primates. The pit for the *ligamentum teres** is almost constantly absent, while in man, Gibbons, and the Chimpanzee it is as constantly present. The Gorilla alone sometimes shares with the Orang the condition of having no such pit.

* This is a ligament which holds the thigh-bone in its place, passing as it does, like a round cord, from the head of the thigh-bone to the inside of the socket of the haunch-bone (*acetabulum*), into which the thigh-bone fits.

The Orang has the shortest shin-bone, compared with the upper arm-bone, and the longest foot, compared with the leg, in the whole order. It has the relatively shortest and most imperfect hallux of any Primate; while in no other ape or Half-ape does the length of the second toe so closely approach that of the forefinger of the same individual.

Estimated by the skeleton only, the Orang cannot be said to approximate to man in any supreme degree, although, as may be remembered, several points have been mentioned in which it is more human than in any other latisternal ape.

The Gorilla and Chimpanzee have been seen to show many approximations to man as regards the skeleton. In some respects one species has been found to be the more man-like; in other points the other species has been so found.

We have found that the Gibbons, one or other of them, exhibit various skeletal characters more human than those presented by

any other members of the order. Finally, we have seen that even some of the Half-apes present most remarkable resemblances to man. The teaching then, of the skeleton, as also of the other parts we have as yet reviewed, seems to be that resemblance to man is shared in different and not very unequal degrees by divers species of the order, rather than that any one kind is plainly and unquestionably much more human than any of the others.

Affinities seem rather to radiate from man in various directions than to follow one special route. At present, however, the facts presented are not sufficient to warrant the expression of a confident judgment. In order to arrive at such a judgment it will be necessary to survey the other organs of the body; and then, summarising the results, we shall have material sufficient to examine the third question proposed, namely, the bearing of the facts upon the theory of evolution as applied to man.

PART III.

HAVING completed our survey of certain characters presented by the skeleton in different species of the order PRIMATES, other systems of organs may now be adverted to.

That system of parts which clothes and is attached to the various parts of the skeleton may be taken naturally after the skeleton itself.

This system consists of the flesh, which, being divided into a number of segments and layers by intervening membrane, constitutes the muscles, or active organs of motion.

The muscles, however, present few characters of any great value for our purpose; and

this might be anticipated, since, being the special organs of motion, they would naturally be expected to be peculiarly modifiable and to present every variety of adaptive modification.

Speaking generally, the apes resemble man myologically more than do the Half-apes, and the latter may present us with special aberrant modifications; such, *e.g.*, as the presence of an extra muscle, called *rotator fibulæ*, placed between the shin-bone (*tibia*) and the adjacent small bone (*fibula*) of the leg.

It is the group of latisternal apes (*Simiinæ*) which approach man most closely in muscular structure, as we have seen they do in the bony framework which supports the muscles.

Amongst these higher apes the Orang shows again a certain inferiority as to its muscles, reminding us of the aberrations we have already seen to exist in its skeleton.

Thus in its foot, the great toe, in spite of its small relative size, is furnished with a special short muscle (called *opponens hallucis*) not found in other latisternal apes, any more

than in man. This, indeed, is a special development, and is no approximation to an inferior type of structure.

On the contrary, both the great toe and the thumb have no distinct tendon sent to them from the deep long flexor muscles of the arm and leg respectively. In this respect we find an inverse difference to that precedingly noticed.

Again, the long muscle called *flexor longus hallucis* does not take origin, as in the other highest apes, from the leg, but from the bone of the thigh.

But neither the skeleton, nor yet the flesh which clothes it, can be considered as the most important system of organs, nor that best calculated to manifest degrees of affinity or supremacy. It is not the pillars, shields, and levers of the body (bones), nor the cords and fastenings which brace together (ligaments), or by tension act upon (muscles) those pillars and levers, which can rationally be regarded as supreme. Such supremacy must

rather be conceded to the regulating and co-ordinating apparatus by means of which the tensions are so varied and directed as to produce harmonious and consentient results. But this supremacy is still further manifest when we consider that the very integrity of these structures is maintained, and their repair effected, by the agency of that very same co-ordinating apparatus which is the controller of animal life, the lord of all within its own boundaries, and which says to every other system of parts, "Starve thou before me."

This supreme and dominant apparatus is the nervous system. The ape, which has this system—and especially the dominant part of this dominant system, namely, the brain—most in conformity with the same system in man, must surely be held to be the most materially man-like in structure.

Now, it is not the Chimpanzee, certainly not the Gorilla nor yet the Gibbons, which most resemble man as regards his brain. In this respect the Orang stands highest in rank,

In the first place, the height of the Orang's cerebrum in front is greater in proportion than in either the Chimpanzee or the Gorilla; while the brain of the last-named animal falls below that of the Chimpanzee, in that it is relatively longer and more depressed, as compared with man's brain.

Each half of the cerebrum is divisible into four parts or lobes (Fig. 54—57.) The first of these (marked 1, 2, and 3) is the "frontal." The second (marked 4, 5, and 6) is the "parietal." The third (marked 10, 11, and 12) is the "occipital;" and the fourth (marked 7, 8, and 9, in Fig. 54, 7, 6, 9) is the "temporal."

On comparing the brain of man with the brains of the Orang, Chimpanzee, and Baboon, we find a successive decrease in the frontal lobe, and a successive and very great increase in the relative size of the occipital lobe. Concomitantly with this increase and decrease, certain folds of brain substance, called "bridging convulsions" (marked α and β),

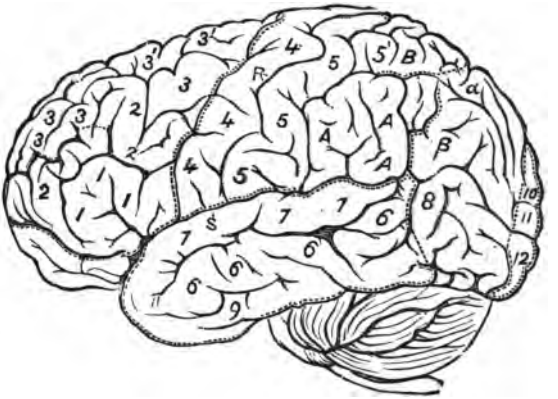

FIG. 54.—BRAIN OF MAN (*Homo*), LEFT SIDE.

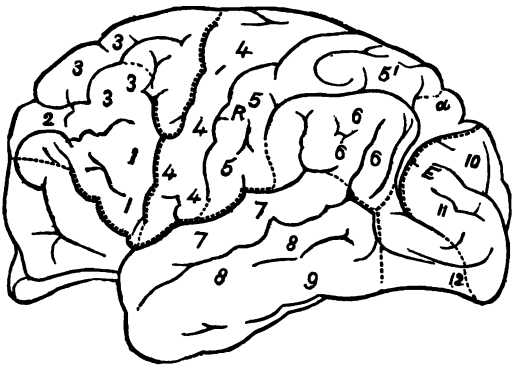

FIG. 55.—BRAIN OF THE ORANG (*Simia*), LEFT SIDE.

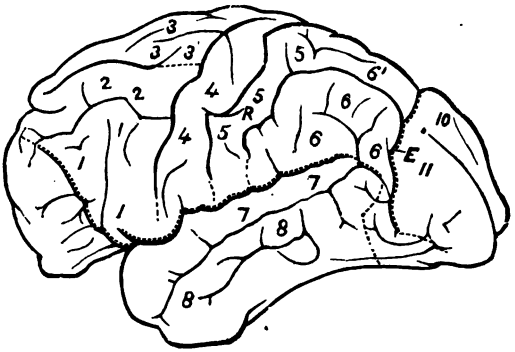

FIG. 56.—BRAIN OF CHIMPANZEE (*Troglodytes*), LEFT SIDE.

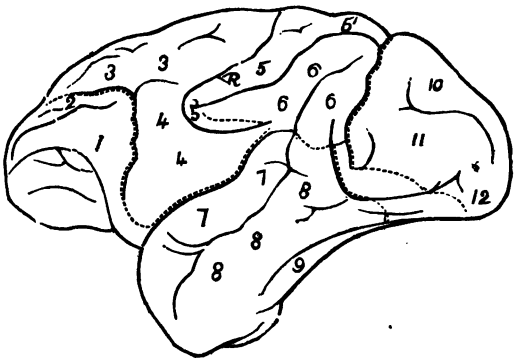

FIG. 57.—BRAIN OF MANDRILL BABOON (*Cynocephalus*), LEFT SIDE.

which in man are conspicuously interposed between the parietal and occipital lobes, seem as utterly to disappear in the Chimpanzee as they do in the Baboon. In the Orang, however, though much reduced, they are still to be distinguished. Besides these matters, the temporal lobe becomes less horizontal and more depressed as we proceed from man to the Baboon.

These distinctions, with some others, have been pointed out in France by the late lamented M. Gratiolet,* and in England by Professor Rolleston.† Mr. Marshall, F.R.S., has also given his verdict ‡ "on the interesting question of the relative superiority of the Chimpanzee's and Orang's brain" "in favour of the latter."

Messrs. Schroeder van der Kolk and W.

* 'Mémoire sur les plis cérébraux de l'homme et des primates.'

† 'Nat. Hist. Review,' vol i. p. 201, and in a Lecture at the Royal Institution, reported in the 'Medical Times' for February and March 1862.

‡ 'Nat. Hist. Review,' vol. i. p. 310.

Vrolik, the distinguished naturalists of Amsterdam, fully recognise the resemblance of the brain of the Orang to that of man to be closer than that presented by the brain of any other ape.

The actual and absolute mass of the brain is, however, slightly greater in the Chimpanzee than in the Orang, as is the relative vertical extent of the middle part of the cerebrum, although, as aforesaid, the frontal portion is higher in the Orang. When we turn to the Gorilla we find, from M. Gratiolet,* that this much vaunted and belauded ape is not only inferior to the Orang in cerebral development, but even to his smaller African congener, the Chimpanzee.

In the first place, its brain scarcely equals (at least in some cases) that of the Chimpanzee in actual mass. It is also flatter, and its frontal lobe is less projecting in front of its temporal lobe. Altogether, M. Gratiolet tells us, its brain-characters make of the Gorilla—in spite

* See 'Comptes rendus,' April 30th, 1860, p. 801.

of its size and strength—the lowest and most degraded of all the latisternal apes. Moreover, the disposition of its convolutions is such as (in the opinion of M. Gratiolet) to connect it with the Baboons, while the Chimpanzee is similarly connected with the Macaques. Our author suggests that if the Orang be considered as the head and culminating point of development, following the line of the Semnopitheci and Gibbons, then the Chimpanzee may be taken to be the head, or, as it were, the Orang, of the series of Macaques, while the Gorilla is but the culmination of that type of cerebral structure elsewhere exhibited by the relatively brutal and degraded Baboons.

This is an appreciation of the animal widely different from that still popular in England, in spite of Professor Rolleston's efforts to propagate the true Simian faith respecting this "would-be king of the *Simiadæ*."

The Professor expresses himself* as follows:

* 'Medical Times,' for February 1862, vol. i. No. 608, p. 184.

"In the world of science, as in that of politics, France and England have occasionally differed as to their choice between rival candidates for royalty. . . . If either hereditary claims or personal merits affect at all the right of succession, beyond a question the Gorilla is but a pretender, and one or other of the two candidates the true prince. There is a graceful as well as an ungraceful way of withdrawing from a false position, and the British public will adopt the graceful course by accepting forthwith and henceforth the French candidate, and by endorsing M. Gratiolet's proposal for speaking of the Gorilla as but a Baboon, of the Chimpanzee as a Macaque, and of the Orang as a Gibbon."

There can be no question, then, but that in this most important organ the Orang is man's nearest ally, while the Gorilla is quite remarkably inferior.

This closeness of resemblance between the brains of the Orang and of man becomes yet more striking when we consider how great

in this respect is the divergence between the Orang and those lowest of Apes—the Marmosets—in which the cerebrum is smooth and entirely devoid of furrows and convolutions. In the lower sub-order—the Lemuroids—the divergence is much greater still, so much so, indeed, that the Half-apes, as to their brains, have far nearer resemblances to animals altogether below the order PRIMATES than to the higher members of that order.

It must nevertheless be borne in mind, if we would estimate the value of these cerebral characters with perfect fairness, that forms zoologically distant sometimes resemble each other in brain-characters, while closely allied forms strangely differ. Thus, as M. Gratiolet has pointed out, the "bridging convolutions" between the parietal and occipital lobes reappear in the Spider Monkeys, while two species of Sapajou (*Cebus*), so closely allied as to have been sometimes treated as one species, differ strangely from each other in this respect.

Again, much stress has been laid, by some writers, on the great relative extension backwards of the hinder parts of the cerebrum and cerebellum in man. But in the little Squirrel Monkey of America the cerebrum extends backwards beyond the cerebellum, much more than it does in ourselves, while in that remarkable species of *Hylobates*—the Siamang Gibbon (which is so man-like in its chin, and which exceeds man in the breadth of its sternum)—the cerebrum is so short as to leave the cerebellum very decidedly uncovered at its hinder part. In the Howling Monkeys, again, this exposure of the cerebellum is yet greater, and nevertheless these monkeys belong to a family in which, as we have seen, the overlapping of the cerebellum by the cerebrum attains to its maximum of development.

Yet the psychical powers of different apes are very similar. Not only the lowest Baboons of Africa (as, *e.g.*, the famed "Happy Jerry" of Exeter Change) can be taught various and

complex tricks and performances, but the less man-like American Monkeys—the common Sapajous—are habitually selected by peripatetic Italians for the exhibition of the most clever and prolonged performances.

As to the two species of Sapajou, the brains of which are so different the one from the other, Professor Rolleston asks: "Will anybody pretend that any difference can be detected in the psychical phenomena, the mental manifestations of these creatures, at all in correspondence or concomitant variation with their differences of cerebral conformation?"

The difference between the brain of the Orang and that of man, as far as yet ascertained, is a difference of absolute mass. It is a mere difference of degree, and not of kind.

Yet the difference between the mind of man and the psychical faculties of the Orang is a difference of kind, and not one of mere degree.*

Thus, on the one hand we see that we may

* See 'Quarterly Review,' July 1871.

have great differences in brain development unaccompanied by any corresponding psychical diversities, and on the other we may have vast psychical differences which it seems we must refer to other than cerebral causes.

Professor Huxley has sought to invalidate such inferences,* first, by asserting, what is of course perfectly true, that intellectual power (as we daily experience it) depends, not on the development of the brain alone, but also on that of "the organs of the senses and of the motor apparatuses." But surely to this we may reply that, in these respects, no one pretends even that there is much difference between man and apes.

Secondly, Professor Huxley objects that the cerebral differences may be of so minute a character as to have escaped observation; and he compares the brains of man and ape with two watches, one of which will, and the other will not, keep accurate time. He exclaims, "A hair in the balance-wheel, a little rust on

* 'Man's Place in Nature,' p. 102, note.

a pinion, a bend in a tooth of the escapement, a something so slight that only the practised eye of the watchmaker can discover it, may be the source of all the difference."

It would be, however, to say the least, somewhat singular to attribute to *hypothetical* and *confessedly minute* differences, effects which as yet we have *not* seen to accompany or be produced by *certainly present* and *confessedly considerable* differences which we *have seen.*

With how much force then does not the comparative anatomy of the present day re-echo the truth long ago proclaimed by Buffon,† that material structure and physical forces can never alone account for the presence of mind.

Speaking of the ape, the most man-like as to brain, he says:—

"Il ne pense pas: y a-t-il une preuve plus évidente que la matière seule, quoique parfaitement organisée, ne peut produire ni la

† 'Hist. Nat.,' t. xiv. p. 61, 1766.

pensée, ni la parole qui en est la signe, à moins qu'elle ne soit animée par un principe supérieur ?"

In passing from the brain to the organs of sense, it may be remarked that the ear of the Gorilla is more human than that of any other Primate, in that it has a rudimentary *lobule*, that is to say, a rudiment of that soft depending portion into which the "ear-ring" is inserted.

The nose, on the contrary, exhibits a prominence slightly approximating to that of man, not in the Gorilla, but in one of the Gibbons, namely, the Hoolock.

The projection of man's nose is, however, exceeded by that of the long-tailed Bornean ape, called the Proboscis Monkey, on account of the length of its nasal organ. It belongs, as was before said, to the genus *Semnopithecus*. No other species of that genus exhibits any approximation to a similar nasal elongation.

The tongue of the Orang is more like that of man than is the tongue of any other latisternal ape, and the large papillæ of the

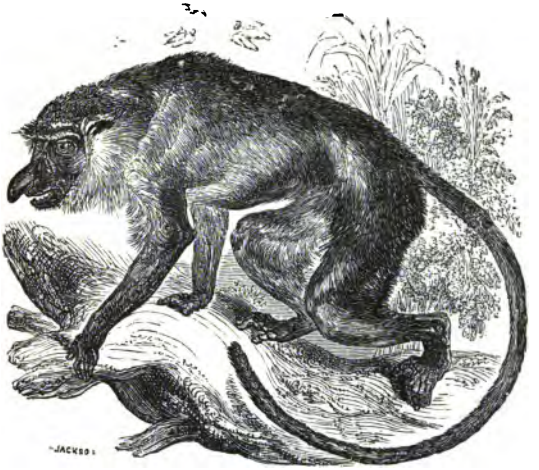

FIG. 58.—THE KAHAU, OR PROBOSCIS MONKEY.

FIG. 59.—FACE OF PROBOSCIS MONKEY.

back of the tongue (called *circumvallate*) more resemble in arrangement even in the Gibbons the same parts in man than they do in the Chimpanzee, and very much more than in the Gorilla.

The Gibbons, however, differ from man and from all the higher latisternal apes in having a little conical bifid membrane developed beneath the tongue.

On the other hand, the Gibbons have a stomach which is very human, and a liver which is more like the liver of man than is that of any other animal whatever.

The liver of the Orang and Chimpanzee is not very different from that of man, but, strange to say, in the Gorilla we meet with a very degraded liver, and one formed on the type of liver which exists in the lower monkeys and the baboons—with the lobes subdivided.

The teeth of apes resemble those of man in varying degrees, and the several resemblances which may exist are by no means present at

the same time in the dentition of any one of the latisternal apes.

1. One striking character of the human teeth is their almost equal vertical development. All the apes, on the contrary, possess more or less projecting tusk-like "eye-teeth," or "*canines*," as they are technically called, because similarly projecting in the dog.

Now, in all the broad-breastboned apes, the canines are both exceedingly long and powerful, and, indeed, the *Simiinæ* are almost like Baboons in this respect.

The nearest approach to man is found, not in the apes at all, but in the Half-apes, where in some forms (as, *e.g.*, *Hapalemur*) the excess in length of the canines over the grinding teeth is very small indeed.

2. The second noteworthy character of the human dentition is the close approximation of the teeth one to another serially, so that no vacant space (or, as it is technically called, *diastema*) is left between any two adjacent teeth.

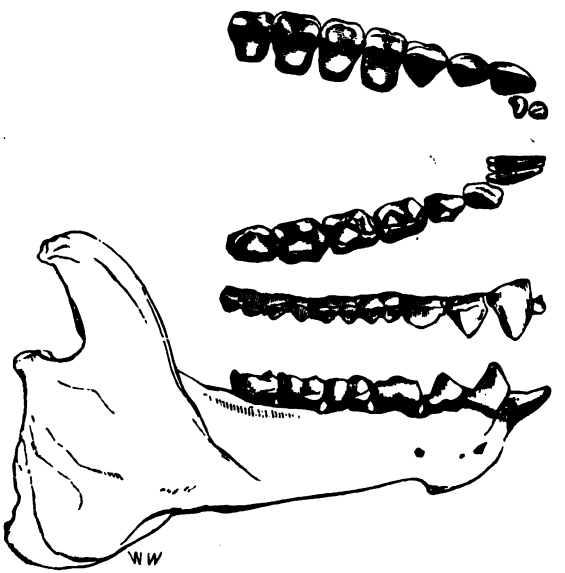

FIG. 60.—DENTITION OF *Hapalemur*.

To find a similarity to man in this respect we have again to descend through the whole series of apes, till we come to the lower and more aberrant forms of the Half-apes, and there alone, in the little Tarsier of Celebes, we once more meet with teeth placed in serial contiguity, as in man.

3. A third character which may here be mentioned, is one exhibited by the masticating surfaces of the larger grinding teeth of the upper jaw. We find in man on the masticating surface of each of these teeth an oblique ridge, running from the front inner angle of such surface outwards, and backwards to its hind outer angle.

This character is found also in the teeth of the Orang, Chimpanzee, and Gorilla, but it does not exist in those of the Gibbons, nor in those of any of the lower *Simiadæ*. Here, then, we seem to come upon a striking character as to affinity with man—a character the more deep and significant, in that it is hard to see how the presence of this slight ridge

should be so favourable in the life-struggle as to be independently developed in different forms by any mere action of natural selection.

Nevertheless, when we pass to the American apes we find it reappearing in the Spider and Howling Monkeys, and, strange to say, even amongst the Half-apes (*e.g.*, in *Arctocebus*, *Microcebus*, and *Galago*) the same structure is distinctly developed.

4. The fourth character is one drawn from the order of the succession of the teeth. Each eye-tooth of the second or permanent set is cut in man before the hindmost grinder but one makes its appearance. In the Orang, Chimpanzee, and Gorilla all the grinders of the second set make their appearance before the canines of the same set. In the Gibbons, the canines accompany, if they do not precede, the appearance of the hindmost grinder, and so far, therefore, these animals seem to approximate to the human condition; but the resemblance is of no significance, since it is a condition often found in the lower apes.

Most of the Gibbons, again, resemble man more than do the Orang, Chimpanzee, or Gorilla, or than many of the lower *Simiadæ*, in the absence of large saccular dilatations, or pouches, in connection with the larynx.

The shape of the stomach is more human in the Gibbons than in the other broad-breast-boned apes.

The Orang has been said to have no uvula, but, as Professor Flower has pointed out, it is present, though disguised by the extent of development of adjacent membrane.

In man and in all Primates the large intestine gives off a considerable blind off-shoot (the *cæcum*), which has attached to it a singular little worm-like process, called the *vermiform appendix*. This is not found in any apes other than the *Simiinæ*, and its development is most like man in the Gibbons.

It may be well now to recapitulate and group together the characters in and by which different apes and Half-apes resemble and differ from man.

Besides the highest apes, certain of the lower and lowest forms have been seen to merit our attention.

The Gorilla resembles man more than does any other latisternal ape in the following points:—(1) The great bulk of its whole body; (2) the possession of a lobule to the ear; (3) the prominence of the upper part of the bones of the nose; (4) the development of a vaginal ridge beneath the skull on each side; (5) the shape of the blade-bone; (6) the relative length of the hand to the spine; (7) that of the fore-arm to the upper arm; (8) that of the thumb to the back-bone; (9) that of the thumb to the whole hand; (10) that of the ankle-bones to the whole foot; (11) that of the great toe to the spine; (12) the length of the neck of the thigh-bone.

The Gorilla differs more from man than do any other of the broad-breastboned apes, in that —(1) The bony muscular ridges on the skull are enormously developed; (2) the cerebrum is of relatively small vertical extent; (3) the

brainfolds (cerebral convolutions) are formed on the type of brain found existing in Baboons; (4) the liver is Baboon-like in its subdivided condition; (5) the large papillæ of the tongue are scattered, and not collected into a V-shaped aggregation.

It should also be recollected that there are characters by which the Gorilla differs more from man than does some one or other of the latisternal forms, whether it be the Chimpanzee, the Orang, or the long-armed apes. Such are the non-development of a chin, the number of ribs, &c., &c.

The Chimpanzee is the most man-like of the *Simiinæ* in the following points:—(1) The shortness of the arms compared with the length of the spine; (2) their shortness (the hands being included) compared with the legs and feet; (3) the length of the humerus compared with that of the spine; (4) the length of the radius compared with that of the spine; (5) the length of the longest toe compared with that of the spine; (6) the near

approximation in length of the great toe to the absolutely longest toe; (7) the height of the frontal lobe of the cerebrum. On the other hand, the Chimpanzee differs from man more than do any of the latisternal apes in that the leg and foot (taken together) are so short compared with the length of the spine. Besides this, as we have seen in several important characters, the Chimpanzee is less human than is one or other of the *Simiinæ*. Such characters are, *e.g.*, the number of the lumber vertebræ, the shape of the blade-bone, of the sacrum, &c., &c.

The Orang is most like man in (1) the development of the beard in the males; (2) in the development of the styloid process; (3) in the length of the leg and foot taken together compared with that of the back-bone; (4) in the length of the crest of the ilium; (5) in the development of the spine of the ischium; (6) in the length of the foot compared with that of the hand; (7) in the relative height of the cerebrum; (8) in the

large proportion of its frontal lobe; (9) in the small proportion of its occipital lobe; (10) in the development of the "bridging convolutions;" (11) in the characters of the tongue; (12) in the high and rounded form of the skull.

The Orang, in addition to the characters before noted,* differs from man more than do any other of the broad-breastboned apes in (1) that the breast-bone is formed of two series of pieces; (2) in the length of the leg, without the foot, compared with that of the back-bone; (3) in the length of the shin-bone compared with that of the femur; (4) in the length of the foot compared with that of the back-bone; (5) in the length of the foot compared with that of the shin-bone; (6) in the length of the foot compared with that of the spine; (7) in the shortness of the tarsus compared with the length of the whole foot; (8) in the shortness of the hallux compared with the spine.

* See Antea, pp. 126, 127.

Some or other of the Gibbons are most like man in (1) the breadth of the breast-bone; (2) the shortness of the cervical spinous processes; (3) the development of a "chin;" (4) in the length of the leg, without the foot, compared with that of the spine; (5) the length of the blade-bone compared with that of the spine; (6) the length of the haunch-bone compared with that of the spine; (7) the breadth of the pelvis compared with the length of the haunch-bone; (8) in the length of the femur compared with that of the spine; (9) the length of the femur compared with that of the haunch-bone; (10) the relative slenderness of the thigh-bone; (11) the length of the shin-bone compared with that of the femur; (12) the length of the foot compared with that of the leg; (13) in the length of the foot compared with the tibia; (14) in the slenderness of the ancle; (15) in the length of the great toe compared with that of the whole foot; (16) the prominence of the nose; (17) the form of the stomach;

(18) that of the liver; (19) that of the vermiform appendix; (20) the succession of the teeth; (21) the absence of laryngeal sacs; (22) the quality of the voice.

All the Gibbons differ from man, more than do any other of the broad-breastboned apes, in that (1) the length of the arms compared with that of the spine is so great; (2) in the excessive length of the leg and foot (taken together) compared with that of the spine; (3) in the length of the foot compared with that of the hand; (4) in the structure of the tongue underneath; (5) in the form of the upper grinding teeth; (6) in the smaller size of the body, and, in the Siamang, in the uncovered cerebellum.

We have seen also that some or other of the Baboons—the lowest of the *Simiadæ*—excel all the higher apes in resemblance to man as to certain points. These are:—(1) The sigmoid curvature of the spine; (2) the lumbo-sacral angle; (3) the concavity of the visceral surface of the sacrum; (4) the con-

vexity of the bones of the nose; (5) the development of the styloid process; (6) the transverse breadth of the pelvis as compared with its depth from the sacrum to the pubis; (7) the greater descent of the inner condyle of the femur; (8) the length of the foot compared with that of the back-bone; (9) the angle formed by the axis of the cranium with the axis of the face.

The *Cebidæ* differ from both man and the *Simiadæ* in such important characters that they cannot but be considered to constitute a family decidedly more inferior and remote from man than that of the Old World apes. Nevertheless, some or other of them resemble man more than do the bulk of the *Simiadæ* in the following characters:—(1) No ischial callosities; (2) no cheek pouches; (3) copious beard and whiskers (Sakis); (4) hair of arms directed as in man; (5) cranium more rounded; (6) cranium higher; (7) face relatively smaller; (8) foramen magnum situate more forwardly; (9) the length of the thumb

compared with that of the hand (*Hapale*); (10) the length of the thigh-bone compared with that of the back-bone (Spider Monkeys); (11) the greater descent of the inner condyle of the femur (Spider Monkeys); (12) the length of the shin-bone compared with that of the femur (Spider Monkeys); (13) the length of the hallux compared with that of the spine (*Pithecia*); (14) the presence of "bridging convolutions" (Spider Monkeys); (15) the very overlapping cerebrum (Squirrel Monkeys); (16) the oblique ridge on the upper grinders (Howling Monkeys).

The Half-apes (*Lemuroidea*) differ, as before said, from both man and true apes in points so numerous and so significant that there can be no question as to their great inferiority and the vast chasm which exists between the two sub-orders.

Nevertheless, we find amongst the Half-apes certain characters which resemble those of man more than do most, sometimes even more than do any, of the characters exhibited

by the true apes. Thus, the typical Lemurs and the Indris have a more completely opposable and better developed thumb than any ape. In the slender Loris we find an absence of the extra interlocking processes (metapophyses and anapophyses) of the back bone, the spinous processes of which do not converge (fore and aft) towards a central point; the pisiform bone of the wrist is smaller than in any ape; the proportion borne by the thumb to the hand in length is more human, as is the form assumed by the ischium, and the relative size of the foot compared with the leg. In the *Indrisinæ* and in *Lepilemur* we find but eight carpal bones (a character found in no other Primates save man, the Chimpanzee and Gorilla), and the most human proportional length of both the thumb and the index finger compared with the length of the spine. We also find in the short-tailed Indris the length of the femur compared with that of the haunch-bone most human, as also the length of the foot

compared with that of the hand, and the near approach made by the length of the "great toe" to the actually longest toe of the foot. In the typical genus *Lemur* we find the proportion (in length) of the thigh-bone to the upper arm-bone most human, as well as that of the longest toe to the back-bone. In the Slow Lemur (*Nycticebus*), the length of the shin-bone bears a relation to that of the thigh-bone more human than in any other species below man, while in other kinds of Half-apes we meet with a development of the anterior inferior spinous process of the ilium more like that of man than we find in any ape; also upper grinding teeth furnished with the "oblique ridge" as in man, and sometimes an almost equality of vertical development in the teeth, and even an absence of any diastema.

Having completed our survey and summary of the structural resemblances and differences presented by the different forms of Primates, we may now consider and endeavour to appraise their value, as bearing upon the

question of the "Origin of Species," and especially upon the asserted "descent of man" from some "non-human" ape ancestor. The question, that is, as to man's body; for as to the totality of his nature no mere anatomical examinations will enable us to decide—that is the task of psychology and philosophy generally.

In the first place, it is manifest that man, the apes, and Half-apes cannot be arranged in a single ascending series of which man is the term and culmination.

We may, indeed, by selecting one organ, or one set of parts, and confining our attention to it, arrange the different forms in a more or less simple manner. But, if all the organs be taken into account, the cross relations and interdependencies become in the highest degree complex and difficult to unravel.

This has been more or less generally recognised; but it has been put forward by Mr. Darwin,* and widely accepted, that the

* 'Descent of Man,' vol. i. p. 197.

resemblances between man and apes are such that man may be conceived to have descended from some ancient members of the broad-breast-boned group of apes, and the Gorilla is still popularly credited with the closest relationship to him which is to be found in all existing apes.

As to the latter opinion, evidence has been here adduced to show that it is quite untenable.

As to Mr. Darwin's proposition, much remains to be said. But it is certainly true that on the whole the anatomical characters of man's body have much more resemblance to those common to the latisternal group than to those presented by any other section of the order Primates.

But, in the first place, we should consider what evidence of common origin does community of structure afford.

The human structural characters are shared by so many and such diverse forms, that it is impossible to arrange even groups of

genera in a single ascending series from the Aye-Aye to man (to say nothing of so arranging the several single genera), if all the structural resemblances are taken into account.

On any conceivable hypothesis there are many similar structures, each of which must be deemed to have been independently evolved in more than one instance.

If the number of wrist-bones be deemed a special mark of affinity between the Gorilla, Chimpanzee, and man, why are we not to consider it also a special mark of affinity between the Indris and man? That it should be so considered, however, would be deemed an absurdity by every evolutionist.

If the proportions of the arms speak in favour of the Chimpanzee, why do not the proportions of the legs serve to promote the rank of the Gibbons?

If the "bridging convolutions" of the Orang go to sustain its claim to supremacy, they also go far to sustain a similar claim on

the part of the long-tailed, thumbless Spider Monkeys.

If the obliquely-ridged teeth of *Simia* and *Troglodytes* point to community of origin, how can we deny a similar community of origin, as thus estimated, to the Howling Monkeys and Galagos?

The liver of the Gibbons proclaims them almost human; that of the Gorilla declares him comparatively brutal.

The ear lobule of the Gorilla makes him our cousin; but his tongue is eloquent in his own dispraise.

The slender Loris, from amidst the Half-apes, can put in many a claim to be our shadow refracted, as it were, through a Lemurine prism.

The lower American apes meet us with what seems "the front of Jove himself," compared with the gigantic but low-browed denizens of tropical Western Africa.

In fact, in the words of the illustrious Dutch naturalists, Messrs. Schroeder van der

Kolk, and Vrolik,* the lines of affinity existing between different Primates construct rather a network than a ladder.

It is indeed a tangled web, the meshes of which no naturalist has as yet unravelled by the aid of natural selection. Nay, more, these complex affinities form such a net for the use of the teleological retiarius as it will be difficult for his Lucretian antagonist to evade, even with the countless turns and doublings of Darwinian evolutions.

But, it may be replied, the spontaneous and independent appearance of these similar structures is due to "atavism" and "reversion"—to the reappearance, that is, in modern descendants, of ancient and sometimes long-lost structural characters, which formerly existed in more or less remote hypothetical ancestors.

Let us see to what this reply brings us. If it is true, and if man and the Orang are diverging descendants of a creature with

* 'Nat. Hist. Review,' vol. ii. p. 117.

certain cerebral characters, then that remote ancestor must also have had the wrist of the Chimpanzee, the voice of a long-armed ape, the blade-bone of the Gorilla, the chin of the Siamang, the skull-dome of an American ape, the ischium of a slender Loris, the whiskers and beard of a Saki, the liver and stomach of the Gibbons, and the number of other characters before detailed, in which the various several forms of higher or lower Primates respectively approximate to man.

But to assert this is as much as to say that low down in the scale of Primates was an ancestral form so like man that it might well be called an *homunculus;* and we have the virtual pre-existence of man's body supposed, in order to account for the actual first appearance of that body as we know it—a supposition manifestly absurd if put forward as an explanation.

Nor if such an *homunculus* had really existed, would it suffice to account for the difficulty. For it must be borne in mind that

man is only one of many peculiar forms. The body of the Orang is as exceptional in its way as is that of man in another. The little Tarsier has even a more exceptional structure than has man himself. Now, all these exceptional forms show cross relations and complex dependencies as involved and puzzling as does the human structure, so that in each several case we should meet with a similar network of difficulties, if we sought to account for existing structural characters through the influence of inheritance and "natural selection."

It may be replied that certain of these characters have arisen in total independence, and this reply is no doubt true; but how are we to discriminate between those which are inherited and those which are independently acquired? Structures like strong teeth or powerful claws, obviously useful in the struggle for life, may well be supposed to have independently appeared, and been preserved time after time; but what characters could well be thought,

à priori, less likely to be independently acquired than a more or less developed chin, such as man shares with the Siamang alone, or a slightly aquiline nose, such as that found in the Hoolock Gibbon and often in the human species? Can either character be thought to have preserved either species in the struggle for life, or have persistently gained the hearts of successive generations of female Gibbons? Certainly seductiveness of this sort will never explain the arrangement of the lobes of the liver, or the presence of an oblique ridge on the grinding surfaces of the back teeth.

Again, can this oblique ridge of the grinding teeth be supposed to have arisen through life necessities? and yet, if it is a real sign of genetic affinity, how comes it to be absent from the man-like Gibbons, and to reappear for the first time in American apes, and among others in the aberrant and more or less baboon-like Howling Monkeys?

The same remark applies to the condition of

wrist-bones of man, the Chimpanzee, and Indris. If this condition arises independently, and is no mark whatever of genetic affinity, what other single character can with certainty be deemed to be valid evidence of affinity of the kind?

But if the foregoing facts and considerations tell against a belief in the origin of man and apes, by the purely accidental preservation in the struggle of life of minute and fortuitous structural variations, do they tell against the doctrine of evolution generally?

To this question it must be replied that, if we have reason to think an innate law has been imposed upon nature, by which new and definite species, under definite conditions, emerge from a latent and potential being into actual and manifest existence, then the foregoing facts do not in the least tell against such a conception—a conception, that is, of a real and true process of "evolution" or "unfolding."

For there is no conceivable reason why

these latent specific forms should not have the most complex and involved relationships one to another; similar structures independently appearing in widely different instances.

Analogy drawn from the inorganic world is all in favour of such latent potentialities, and the process of development of every individual animal is the unmistakable manifestation of actual organic evolution and emergence of real from potential existence in each separate case.

It has recently been strongly asserted by Dr. H. Charlton Bastian,* that organic nature does manifestly contain within it these innate powers of developing new and definite forms, more or less like those existing in inorganic nature, as evidenced by crystallisation.

He has given detailed descriptions † of the most strange and startling direct transformations amongst the lower animals, including the direct evolution of Rotifers and Nematoid worms. Moreover, the evidence of the

* 'The Beginnings of Life,' 1872.

† L. c. vol. ii. pp. 307–540.

occurrence of sudden and direct transformations does not repose on Dr. Bastian's observations alone. Similar phenomena have been observed by M. Pineau, M. Jules Haime, M. T. C. Hildyard, Mr. Metcalf Johnson, Dr. Gros, and M. Nicolet.*

It would be difficult and eminently unscientific summarily to reject such an accumulation of evidence. To do so simply on an account of *à priori* prejudice, reposing upon nothing better than negative testimony, would be in the highest degree unphilosophical.

Moreover, we have of late years become acquainted with the remarkable fact of the occassional sudden transformation of a certain large Mexican Eft with external gills—the Axolotl—into an animal not only of a different species but of a different genus. Here the whole structure, the arrangement even of certain bones and distribution of the teeth in the jaws, becomes transformed without the

* For an account of their observations and references to their original statements, see 'Bastian,' Op. cit. vol. ii. pp. 493–527.

FIG. 61.—THE AXOLOTL SEEN ABOVE, AND ALSO A VIEW OF THE UNDER JAW AND THROAT.

most careful observations having as yet enabled us to discover what conditions determine in these exceptional cases such a marvellous metamorphosis.

It is true that the Axolotl has characters of immaturity, and that the form ultimately attained by it is probably the fully-developed condition; but the wonder is thus only increased, since while the ordinary and immature Axolotls breed freely, the rarely-developed adults are absolutely sterile.

To revert from this digression, however, to the question of the cause and mode of specific origin. I have elsewhere* endeavoured to show, by many different facts, what is the teaching of nature as to such origin—namely, that very frequently indeed similarity of structure may arise without there being any genetic affinity between the resembling forms,† as also that it is much rather to an internal cause or principle than to any action of

* 'Genesis of Species,' 2nd edition, 1872.

† 'Genesis of Species,' p. 71, chap. iii., on the coexistence of closely similar structures of diverse origin.

surrounding external conditions that the origin of new specific forms is due.*

The characters and relations exhibited to us by the history of the highest order of mammals—the order Primates, common to us and to the apes—seems then not only fully to corroborate, but to accentuate and intensify the arguments advanced in the 'Genesis of Species' in support of what the author believes to be the more philosophical conception of the cause and nature of "specific genesis" generally.

Not only is there abundant reason to believe that apes and Half-apes have little, if any, closer genetic affinity than they have either with Lions or with Whales, but there is some evidence to support the belief that the apes of the Old and of the New Worlds respectively (the *Simiadæ* and *Cebidæ*) have been created independently one of the other, and that the various common characters they exhibit are but parallel adaptive modifica-

* Op. cit. p. 251. chap. xi., on Specific Genesis.

tions, due simply to similarity as to the exigencies of life to which they are respectively exposed.

Fossil remains, as yet unknown, may bridge over the gulf at present existing between these families. It would be a bold thing to positively affirm that such will not be discovered, when we reflect how very few are the extinct animals known to us compared with the vast multitudes which have existed, how very rarely animal remains are fossilised, and how very rarely again such fossils are both accessible and actually found. Nevertheless, the author believes that it is far more likely that tropical geological explorations may reveal to us latisternal apes more human than any now existing, rather than that they will bring to our knowledge forms directly connecting the *Simiadæ* and *Cebidæ*.

To return from this subordinate question, it may be asked, "What is the bearing of all the foregoing facts on the origin and affinities of man?"

Man being, as the mind of each man may tell him, an existence not only conscious, but conscious of his own consciousness; one not only acting on inference, but capable of analysing the *process* of inference; a creature not only capable of acting well or ill, but of understanding the ideas "virtue" and "moral obligation," with their correlatives freedom of choice and responsibility—man being all this, it is at once obvious that the principal part of his being is his mental power.

> **In nature there is nothing great but man,**
> **In man there is nothing great but mind.**

We must entirely dismiss, then, the conception that mere anatomy by itself can have any decisive bearing on the question as to man's nature and being as a whole. To solve this question, recourse must be had to other studies; that is to say, to philosophy, and especially to that branch of it which occupies itself with mental phenomena—psychology.

But if man's being as a whole is excluded from our present investigation, man's body

considered by itself, his mere "massa corporea," may fairly be compared with the bodies of other species of his zoological order, and his corporeal affinities thus estimated.

Let us suppose ourselves to be purely immaterial intelligences, acquainted only with a world peopled like our own, except that man had never lived on it, yet into which the dead body of a man had somehow been introduced.

We should, I think, consider such a body to be that of some latisternal ape, but of one much more widely differing from all the others than such others differ one from another amongst themselves. We should be especially struck with its vast brain, and we should be the more impressed by it when we noted how bulky was the body to which that brain belonged. We should be so impressed because we should have previously noted that, as a general rule, in back-boned animals, the larger the bulk of the body the less the relative size of the brain. From our knowledge of the

habits and faculties of various animals in relation to their brain structure, we should be led to infer that the animal man was one possessing great power of co-ordinating movements, and that his emotional sensibility would have been considerable. But above all, his powers of imagination would have been deemed by us to have been prodigious, with a corresponding faculty of collecting, grouping, and preserving sensible images of objects in complex and coherent aggregations to a degree much greater than in any other animal with which we were before acquainted. Did we know that all the various other kinds of existing animals had been developed one from another by evolution; did we know that the numerous species had been evolved from potential to actual existence by implanted powers in matter, aided by the influence of incident forces; then we might reasonably argue, by analogy, that a similar mode of origin had given rise to the exceptional being, the body of which we were examining.

If, however, it were made clear to us—immaterial intelligences—that the dead body before us had been, in life, animated, not by a merely animal nature, but by an active intelligence like our own, so that the difference between him and all other animals was not a difference of degree but of *kind*—if we could be made to understand that its vast power of collecting and grouping sensible images served but to supply it with the materials made use of by its intelligence to perceive, not merely sensible phenomena, but also abstract qualities of objects—if we became aware that the sounds uttered by it in life were not exclusively emotional expressions, but signs of general conceptions (such as predominate in the language of even the lowest savage), then the aspect of the question would be entirely altered for us.

We should probably decide that if the body before us seemed to us to be so little related to the informing rational soul that its existence anterior to and independent of such rational

soul was quite conceivable and possible, then its origin by process of natural evolution would, indeed, also be conceivable and indeed *à priori* probable.

But if, on the other hand, we were convinced, from whatever reason, that it was inconceivable and impossible for such a body to be developed or exist without such informing soul, then we should, with perfect reason and logic, affirm that as no natural process would account for the entirely different kind of soul—one capable of articulately expressing general conceptions*—so no merely natural process could account for the origin of the body informed by it—a body to which such an intellectual faculty was so essentially and intimately related.

* "It is not emotional expressions or manifestations of sensible impressions, however exhibited, which have to be accounted for, but the enunciation of distinct deliberate judgments as to 'the what,' 'the how,' and 'the why,' by definite articulate sounds; and for these Mr. Darwin not only does not account, but he does not adduce anything even tending to account for them." 'Quarterly Review,' July 1871. Article, 'The Descent of Man,' p. 79.

Dropping now the metaphor of immaterial spirits, it seems that the answers supposed to be given by such spirits must be the answers really given by sincere and unbiassed investigators in the combined spheres of Zoology and Anthropology.

But however near to apes may be the body of man, whatever the kind or number of resemblances between them, it should be always borne in mind that it is to no one kind of ape that man has any special or exclusive affinities—that the resemblances between him and lower forms are shared in not very unequal proportions by different species; and be the preponderance of resemblance in which species it may, whether in the Chimpanzee, the Siamang, or the Orang, there can be no question that at least such preponderance of resemblance is *not* presented by the much vaunted Gorilla, which is essentially no less a brute and no more a man than is the humblest member of the family to which it belongs.

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